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VOLUME

IN THE SUPERIOR COURT,

State of California, County of Sacramento.

OCTOBER SESSION, 1881.

HON. JACKSON TEMPLE, - - - - - PRESIDING JUDGE.

WINFIELD J. DAVIS, OFFICIAL REPORTER.

SAMUEL OSBOURNE AND WILLIAM M. CUTTER, REPORTERS.

The People of the State of California,
vs.
The Gold Run Ditch and Mining Co.

COUNSEL:

For Plaintiff,

HON. A. L. HART, Attorney General, GEORGE CADWALADER, ISAAC S.
BELCHER, A. L. RHODES, RICHARD BAYNE.

For Defendant,

J. K. BYRNE, W. C. BELCHER, S. M. WILSON, W. T. WALLACE, A. B. DIBBLE, A. P. CATLIN.

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In the Superior Court of the
State of California in and for
the County of Sacramento

The People of the
State of California

- vs -

The Gold Run Ditch
and Mining Company

Friday

Decr 9. 1881.

Afternoon

Session

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Reported by
Winfield J. Davis
Official Reporter

Afternoon Session
Friday Dec. 9th/81

Testimony
of
Dr. G. E. Simmons

resumed

Mr. Belcher What was the
Character of the population here
in 1850? and so on to 1860?
as compared with the population
now? A. They were mostly
young and vigorous men.

Q What was the class of pop-
ulation? A Yes sir

Q Very few women? A Yes sir

Q And as to children?

A Very few children.

Q And take the population now:

What is the proportion of children?

A I should think about $\frac{1}{5}$.

About that.

Q Between what ages do you
now speak of children when
you say that the proportion is
 $\frac{1}{5}$? A Under 18

Q Do you think that $\frac{1}{5}$ would

be a fair proportion to give for children? A About that

2 Under 18? A Yes sir

2 And now as to the proportion of women? A Not quite half

2 A little less than half?

A Yes sir

2 And the proportion now of old men, from fifty years upwards would be what as compared with it then?

A I should think it would be double now

2 Are there not ten times as many men here to-day, from 50 years old upwards as there were here of that age from 1850 to 1855?

A I don't think so many as that.

There is a large difference but not so great as that.

2 What is the average mortality among children as compared with that among men from 20 to 40 years of age?

A In this City?

2 You may take it for the world generally?

Q. Children under what age?

I You spoke of children as from birth to 18 years?

A In speaking of the proportion of children I had school children more particularly in my mind.

I I wanted to know of all children whether they went to school or not?

A Well, most all children go to school so that the answer would be the same.

I Do they begin at their birth?

A Well, when we speak of the mortality among children we do not speak of children up to eighteen.

I Well, take children from birth up to 10 years?

A Up to 10 I cannot say, but up to five I can. Up to five I think about 33 percent die.

I Before they are five years of age?

A Yes.

I Now what percentage will you add to that for children between 5 and 18?

Q Not including the first?

2 You may include the first.
Put it either way?

A That is a question I have not given any thought to

2 Well, the rate of mortality from 5 to 18 is much greater than from 20 to 40 years, is it not?

A It is greater, certainly

2 Is it not very much greater?

A Yes sir

2 Is it not also very much greater from 50 upwards than between 40 and 20?

A Yes
2 Is it not true that the greater portion of the population from 1850 to 1860, were young men between 20 and 50?

A Yes sir

2 What ratio would you make as to men over fifty and between 20 and 50 for a ratio of mortality? Approximately?

A A ratio for thousands?

2 Yes: That is the only ratio we have been assuming thus far? Ratio for a thousand?

A I should think it would be double that of the ordinary ratio. The ordinary ratio would be about twenty

Q When you speak of the general health that includes of course all varieties of diseases whether of a simple or a serious character, does it not? A Yes

Q Is not a very large proportion of the diseases that the physicians have to deal with now, the diseases that are peculiar to women and children? A That is an

element we didn't have. now

Q Now is not that a very considerable element? A

It is a considerable element. Yes Sir.

Q Is not that a very large element, entering into your estimate of the general health

A The diseases affecting women and children may arise from the same causes that injuriously affect the health of the adult and the aged.

Q Is that an answer to my question? Read the question Mr Reporter.

The reporter read
Mr Belcher Now it either is or is not? A It is not a very large element; no sir. The question of sex or of age did not come into my mind, with respect to the type of diseases here, upon which I based my reply.

Q But is it a fact, that there is a large element here, which should be taken into consideration, — of women and children? That were not here in those years of 1850 to 1860?

A They have diseases peculiar to themselves.

Q No matter about their diseases. That is not what I am asking you. Mr. Reporter read my question.

The reporter read

Mr Belcher Now there either is or there is not?

A There is, or is not a large number of children. Sir

Ask me about the Malaria
diseases —

Q Inté } Now I did not.
I am asking you now whether
there are a great number of wo-
men and children here that
were not here in those years?
Not as to particular individuals?

A I have answered that ques-
tion once in the affirmative

Q What proportion in your
judgment of the inhabitants of
the City at this time are men
and women over 50 years of
age? A I will give you
my opinion (reflecting). I
should think $\frac{1}{10}$ would be a
fair estimate and $\frac{1}{5}$ for chil-
dren under 18 years of age?

A Yes sir

Q Now the rate of mortality
amongst men and women of
that age, is double what it
is amongst women and men
from 20 to 50, — if I under-
stand you correctly?

A Yes sir

Q. Double what it would be

Between 20 and 50². a ² Is
 2 And the rate of mortality
 between birth and 18 years
 would be how much greater
 than between 20 and 50.

A The answer up to five years
 is 30²%. After the diseases
 incident to childhood have
 been passed, there is a period
 of youth which is comparative-
 ly healthy.

I will you make some approx-
 imate estimate, from birth to
 18 years². A You gave me
 a question not in regard to
 sacramento particularly but
 as to infantile mortality the
 world over.

I Yes sir, I did².

A Well. (reflecting) I should
 think that 5% would be a
 fair amount to add for the
 mortality between 5 and 18

I That would make the mor-
 tality from birth to 18 - 38%².

A Yes sir.

I Is it not also true that
 in those earlier years, there

were very few men that were up to 50 years of age, who were to be found in this City, or any where about here, or in the state so far as you knew?

A Nearly all were younger than fifty

Q Now, have you any means of determining, or do you know as to the comparative death rate in this City and in San Francisco and in Oakland and in Los Angeles?

A I have it here.

Q Well, what was during this last year - 1879 to 1880?

The Court. Perhaps it would be agreed that those results may be read from the printed report in the argument? I suppose this is an official report

Mr Belcher If the Attorneys on the other side agree

Mr Hart. I don't know anything about that report?

The witness It is the report of the State Board of Health

Mr. Hart. For the purpose of showing the comparative death rate, I have no objection to it. It may be read in argument.

The Court. Does it show the death rate at the different places in the State at the same and at different times?

Mr. Belcher. Does it show the death rates at different times, between 1850 and 1860?

A. I have other reports that will do that.

Mr. Cadwalader. Do I understand that embraces the whole State or only parts of it?

Mr. Belcher. I presume that the reports embrace certain points in the State.

Mr. Catlin. It embraces prominent places in the State.

Mr. Belcher. Let us look and see [Examining]

The witnesses. I have a paper here showing the death rate here for 25 years.

The Court. Is it understood that the reports of the State

Boards of Health may be read
and commented upon in the
argument.²

Mr. Hart As to the death
rate in different parts of
the State

Mr. Belcher And as to the gen-
eral health

Mr. Hart. No sir. I don't
understand that those reports
say anything definite about
that. But we don't agree that
they may be quoted as to the
general health. They are not
to be admitted in this case
for that purpose. They may
be read from in argument
upon the comparison of death
rates. But as to the other
matter, this witness is on
the stand to be examined in
reference to it.

Mr. Belcher These are official
reports

Mr. Hart. You can have the
opportunity of offering them
in evidence when you come
to your case

Mr Belcher Are these official reports? A They are the reports of the State Board of Health.

I made to the Legislature and addressed to the Governor?

A Yes sir

Mr Belcher If these reports contain these statements and we can use them in argument we don't desire to examine that witness any further on this point

The Court It seems to be consented that you may read them so far as the reports of mortality are concerned.

Mr Belcher Do these reports say anything about the general health?

The Witness Here is a report of the late Dr. Logan of the mortality rate in Sacramento for the last 25 years

Q Does this show the death rate for other places than Sacramento during those years?

A That particular one does not.

This is the only one I bought.
There are many others which
give a list of other places.
Dr Hatch can certify to these
things better than I can.

Mr Belcher Now on your direct
Examination you spoke of a
Change in the type of diseases
up and down the Sacramento
river? did you mean to limit
that to Sacramento and its im-
mediate neighborhood, or to
include the river up and down.

A The immediate neighborhood
of Sacramento: I do not
practice outside at all.

Q And you know nothing of
your own knowledge in regard
to the character of diseases
further up the river? as in
Colusa? A No sir.

Q Is it not true, Doctor, that
there has been a change of type
in the matter of lung diseases
in New England? Even within
your recollection?

A You mean a greater
prevalence of Consumption?

I do not speak of a greater or less prevalence: but of a change in the character or type of the disease itself: of Consumption?

A I do not think that there has been any change of type

Q When you were a young man, did you know of what they call slow consumption?

A Yes sir. But that was not Consumption

Q That was a disease of the lungs? A. No sir.

Q Were there diseases of the lungs in those days? A Yes sir

Q Has not that type pretty nearly disappeared? That same slow disease? A No sir

Q Do you speak of it now just as you did then?

A That was not Consumption. It was either Chronic pneumonia or Chronic Bronchitis.

Q It was a disease of the lungs that remains the same - do you say - and prevails to the same extent as in England

years?

A. Yes sir

Q. Do you say that it has not changed its character at all and is as prevalent now as in earlier years? A. I do not believe there is any difference in that respect. But the recognition of the different form of lung disease is more accurate now, that is all.

Q. Well, is it not the fact, that Consumption, properly so designated, is much more common throughout New England now than it was when you were a lad?

A. On the contrary. The rate has decreased since I was a lad. That is, the death rate from that cause in New England, in proportion to the population. Before that time it had increased; for 50 years perhaps.

Q. It had been increasing for that time, and has since decreased.

A. Yes sir. That is slightly. It has not increased.

Q. Is it not true, that up to

60 or 70 years ago, what was popularly called ~~quint~~ Consumption was heretofore known in New England? A Yes sir

I And is it not true, that owing to some cause, within the last 30 or 40 years it has gradually and considerably increased? grown in prevalence

A I don't know that I know what you mean, by the disease popularly called ~~quint~~ Consumption

I Well, that disease which has been rapidly & conclusively?

A Those cases are more apt to be pneumonia; not consumption at all

I No matter whether it is pneumonia or not? I am asking about a disease popularly called ~~quint~~ Consumption? did not that disease make its appearance, practically, about 50 or 60 years ago and then increase rapidly for 30 or 40 years? and then decrease or not increase — as you stated a little while

Since? Or perhaps you will tell us as to what did become of it? I ask you first in reference to its appearance there?

A I have no means of knowing about the proper idea of quick consumption.

Q Then we will take it: diseases of the lungs that commence and proceed rapidly to dissolution?

A That is pneumonia.

Q Pneumonia is what you now call it? A In my judgment that disease yet exists.

Q I am asking you about the beginning of it? when it appeared? whether that appeared as the one I speak of? A That I cannot tell you.

Q That you don't know?

A No sir.

Q You don't know about the history of that at all?

A Now, I know that there were a great many cases called consumption that were not consumption both slow

and quick

I And I think you answered that as to what was called Slow Consumption, that that prevailed now as it did many years ago? A I think so. That is, what is known as Slow Consumption

I Precisely! That is what I am talking about! What was popularly so known. Is it not true, Doctor, that every where the character of diseases gradually change? Take any given place? San Francisco or New York or Albany or one of the Counties in the interior of the State there? Is it not true that taking a period of 30 or 40 or 50 years there will be changes in the Character or type of diseases prevalent in those districts?

A Take San Francisco: I don't think the fever have changed there.

I Take one of the older and settled communities. One of

One of the interior Counties
of New York or New England that
has been settled for many years.

As I answered you in the
first part of your Examination:
The malarial fever have given
place to typhoid fever in nearly
all the large towns of the west
2 and in the East as well
a Yersin. But in the west
in our own day

Re-direct Examination

Mr. Hart. Leaving out of
consideration the escape of
water by the raising of the
river bed: what has been
done in this community for
the purpose of improving health
since 1870? A We have
adopted a system of sewerage
Mr. Belcher This would not
be in re-direct Examination

Mr. Hart. Yes sir.

Mr. Belcher It is new matter
which we may re-direct Examine
upon

Mr Hart. You can re-examine him if you wish to. Certainly I have as much time as you have. So on

A We have adopted a system of sewerage. We have filled in a great many blocks and sewered them. The exact number I can not give. But from the high grade down to the old line we have put in excellent sewer pipe. We have filled in hundreds of low lots and cellars. We have straightened the drainage canal. We have had a competent Health Officer actively at work making the people do their duty as regards to matters pertaining to health. We have disinfected hundreds of places with proper disinfectants, sulphur and iron for instance. And whenever a privy vault was found that was an evident nuisance - when the odor was particularly foul or the offensive matters were near the surface

We have had the adoler ex-
cavator at work: cleaning
out and carrying the contents
away

Mr Hart. Have any sanitary
regulations been adopted by the
City and the several Boards of
Health - when did the system
of sanitary regulations com-
mence? A I think it was

perhaps 18 years ago that it
commenced; of course in a
very imperfect way. It has
been gradually developing

Q When did it develop itself first into its present improved condition?

A I think about ten years ago. I ought to have mentioned another thing that the Board of Health have done and that is in regard to vaccination. We have had no small pox here although it has been all around us. We have had no fatalities from small pox and we have been instrumental in framing a law or ordinance under which all school children are vaccinated, therefore that element of protection that was not here in early times exists at present.

Q Is there any one or two diseases which alone have not been decreased by the Health regulations of this City? A What we would call sewer diseases,

drainage diseases such as typhoids have increased until the mortality of 1879 this is the last Report, shows 22 deaths from typhoid and a little over 4 percent of all the mortality is from typhoid

Q Is that an increase or decrease of that disease over 1850?

Mr Becher I object to that as not redirect examination

Q Show about all other diseases except those affected by sewage?

Mr Becher I object to the question on the ground that it is not redirect examination

<Objection overruled>

A A decrease in malarial diseases and epidemics not associated with foul sewerage

Q To what is that decrease due? Alwell in the

Case of small pox it would be due to vaccination

Q I simply want you to state generally

A The increased comfort of the inhabitants

Q What reason do you give for the decrease of mortality since 1850, the proportionate mortality?

A I give as a reason that this used to be a centre for a very large outlying population to come for medical relief and nursing and that year by year has been decreasing and another element is that about 10 years ago the Sacramento County hospital was moved outside of the City limits. Its mortality before that time used to be included in our City rate. At the time I was County Physician the mortality went into that of the general

mortality of the City and a very large number at that time were hopeless cases brought here almost dying.

Q Where from? A Different parts. They came here as a centre and very few of them belonged here properly.

Q State whether or not at that time there were any private hospitals maintained here in addition to the County hospital? A There were

Q Do you know how many? Mr. Barlin A That time are you speaking of?

Mr. Hart 1850 and up

A There were three places that I remember of that private kind where the sick could get accommodated.

Q You state in your cross examination that in Massachusetts malarial fever sometimes followed the draining of ponds. Now state where that was

true? a I stated that
 in Massachusetts there
 have been lately and
 only lately some cases
 that had followed the
 draining of ponds and
 that the earlier malarial
 fever was present there
 about the time of the
 Revolutionary War and
 that after that the fevers
 were of a typhoid character
 and malarial diseases
 were comparatively un-
 known but within the
 last year the Boston
 Medical and Surgical
 Journal has had a
 number of cases reported
 of malarial fever and
 the ones I remember followed
 the draining of a pond
 in midsummer

Q What was the reason
 of that? a The reason
 was the exposure of
 vegetable mold or decay
 to the heat of the summer

sun and the germs of malaria were disseminated through the air. Why that should not have come in former years under the same influences I cannot tell.

Q From your experience and knowledge how much has the ripage water in the ground been raised in the City of Sacramento since you first knew it?

Mr Becher I object to the question that it is not re-direct examination.

Mr Starr It is a question that I forgot to ask on the direct examination.

The Court It is certainly new matter and is not in response to anything brought out in the cross examination.

Mr Starr Certainly not but the Court may limit me of course in my re-direct examination yes.

I have a right as a
 general thing unless the
 Court exercises its dis-
 cretion against me to
 recall the witness while
 he is on the stand and
 examine him about matters
 which I had forgotten
The Court asks him the
 question

Q Answer the question
 if you know, doctor

A I made an estimate
 last winter in regard to
 this subject happening to
 live upon the same block
 that I did in 1850
 that is my office is on
 the same block. I
 recollect what the original
 level was there and it
 is my opinion that five
 feet would be a fair
 measurement for the in-
 crease of the height of
 the pipe water

Q Five feet? Ayes.

Q Does or does not the

increased height of sewage
water affect the vaults of
which you spoke in your
direct examination in
Winter alone or in Winter
and sum both

< Objected to. >

< Question withdrawn? >

Q Well doctor what times
of the year does the
rise of sewage water
affect the vaults spoken
of by you in your cross
examination?

Mr Belcher I object to
the question because it
is not in direct exam-
ination and because he
went over it in the direct
examination

< Objection overruled >

A During the winter

Q During the winter?

A Yes, what is known
as the rainy season,
winter and spring

Re cross Examination
of
G. L. Simmons

Mr Becher Q And I think in answer to a question which I proposed to you, doctor, you said that you included in the seepage water all the water found in the soil here.

Mr Hart He asked that question and got an answer to it on the cross examination and I objected to it on that ground.

< Objection overruled; plaintiff excepts >

< The question is read by the Reporter >

Mr Becher < Continuing > All the water that there is in the ground at the seasons or season of which you have just been testifying in regard to seepage? A That I included that

Ex

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as seepage?

© All the water there is no matter from what source it may have come?

A I did not mean to convey the impression that the surface water would be seepage water. I would like to correct that. I understand the word seep means to ooze and this oozing process goes on under the pressure or whatever you call it of the high water in the river.

Mr Belcher I would like to ask permission of the Court to examine the witness a little farther in regard to seepage. I did examine him on his cross examination before but I now want to ask him about certain matters as to the levees and whether he has seen the water ooze through these levees

As he now defines the word
I take it that he means
the water that percolated
through the original bank
or through the levee from
the river. < To the Witness >

Am I right as to your
definition of ripage water?

A I believe that is proper
Mr Sturt I object to any
examination of this Witness
that is not strictly in
re cross examination.

Counsel have examined on
that question once before
and he should not be
permitted to consume the
time of the Court on
this question which he
has drawn out himself

The Court I do not know
that I see any importance
in the proposed examination

Mr Belcher If it is not
important then of course
the Court will not permit
me to go into it

The Court Of course that

is what I meant to intimate. I do not see its importance.

Q And within these last few years your system of sewerage and sewer pipe has been adopted here. Is it true also that it has been adopted in other places in the State, or do you know about that?

A I do not know about that.

Q You do not know of any other place except this? A No sir

Q When did it commence in this City? A I think the first organized attempt to introduce sewer pipe was about six or seven years ago.

Q Well is it not true also that the natural sewerage of the City by the sloughs which there were passing through it was much more effective in 1850 than all the artificial works which

have been made since?

Mr Start I object to the question on the ground that it is not in re-cross examination

Mr Leadwaler What do you mean; by putting the natural offal of the City into a slough, is that what you mean?

Mr Belcher I mean that the natural sloughs afforded a better sewerage than this sewerage system which has been adopted by the City

Mr Start We are willing to admit that fact.

<Objection sustained>

Q Do you mean doctor, that vaccination is a thing that was not resorted to at an earlier day than 10 years ago?

A I mean to say that there was no attempt made for a law regulating the admission of children

into the public schools
in that connection

Q Well is it not true that
vaccination is very general
from 1850, or from the time
when children first made
their appearance here?

A On the contrary before
the orders of the Board
of Health and the regulations
adopted by the School
Board through their in-
fluence we had regular
periodic attacks or
epidemics of small pox
and of late years, although
it has been all around
us and of late immediately
in this vicinity there has
not been a case in Sacra-
mento and there is no
logical influence than
that the material here
for small pox to work
upon does not exist

Q Now if it were stated
as a fact that there never
had been a case of

small pox in Marysville would that be evidence that they did not have it there. A That they might not have it?

Q Yes, or that the material did not exist there

A It might not come to the place but being in its close proximity

Q Suppose a case had been brought there but nobody caught it from the party, suppose that he came from this City or San Francisco, would that be evidence that there was no material there for small pox? A It certainly would

Q Has there ever been any considerable number of deaths from small pox except in a single year since you came here, in 1862 or thereabouts?

A We have had quite a number of epidemics of

small pox. The mortality was greatest about 1862 and we had another epidemic about 1868

Q Were there any prior to 1862 between 1850 and 1862? A There were sporadic cases. No epidemic that I remember

Mr Becher In connection with the doctor's testimony these tables of mortality are considered as introduced in evidence

Mr Stark No they are considered as matters that can be read on the argument

Mr Becher I desire to recall Dr Simmons and to introduce them in evidence

Mr Stark I object to his introducing any evidence while we are introducing our evidence. They can be read on the Argument of course if they desire it. They can be read in

evidence on their side of the case but not upon ours.

Mr Belleh I desire to offer them in evidence^{wh} examine this witness upon them. They may be taken as being introduced in evidence in connection with the witnesses evidence.

Mr Start We do not introduce them with his evidence.

The Court No, but they want them in in connection with this testimony.

Mr Start They can read them in connection with his testimony but I submit that it is not proper practice under any circumstances for the defendant to put in testimony before the plaintiff has closed.

The Court In connection with the cross examination exhibits may be offered and

it would be only saving the witness stating it

Mr Starr they can read them on the argument but I do not introduce them in evidence

Mr Badwalader We offer in evidence this table of the rain fall in Sacramento for 31 years

Mr Belcher Whenever it is offered in connection with some testimony it will be considered

Mr Badwalader We want it in our case that is the point and I will give you time to examine it

The Court It will be understood that the mortality table will be read in connection with his testimony

Mr Belcher Yes.

Testimony

F. W. Hatch

Called for plff. sworn.

Interrogatory Q What is your profession? A Physician

Q How long time you have been practising as a physician?

A Since 1843

Q Of what School are you a graduate? A Of the University of New York

Q Where are you practising as a physician now?

A In Sacramento

Q How long have you been practising in Sacramento?

A Somewhat actively since 1853

Q How long have you lived in Sacramento? A I came here in December 1851

Q Have you occupied any official positions in your profession? A Yes

Q In connection with your profession? A Yes

Q What were they?

A A member of the Board of Health

Q Of which Board?

A of the City Board of Health

Q And the State Board also? A The State Board also.

Q What position have you held of the State Board of Health?

A Secretary.

Q And of the City Board?

Answer I have held several positions, President and Secretary of the City Board of Health

Q When did you first become acquainted with the American river?

Answer I saw it when I first came here

Q In 1851? A In 1851

Q What was its condition in 1851? What kind of water did it carry?

A It was tolerably clear

water; not perfectly

Q Did you notice its bed, the bottom of its bed?

A No sir I did not.

Q Since you have been here have you noticed whether or not that river has been filled up any?

A It has

Q Can you state to what extent? A Well at the mouth, the old mouth of the river to the extent of its banks pretty much — nearly so

Q You know whether or not the Sacramento river has been filled up any?

A I think it has.

Q When did you first become a member of the Board of Health, the City Board of Health?

A At the time of its organization. I have forgotten what year it was. I think it was in 1860

Q 1860? A Yes.

Q Have you been a member ever since? A Yes. Well with the exception of an interval of a year.

Q During the time you have been a member what have been your general duties, what have been the general matters of investigation by the Board?

A Matters pertaining to the health — public health

Q of the City? A Yes.

Q During that time have any particular matters affecting the public health come under your observation?

A Yes there have

Q Have you noticed whether or not the effect of the raising up of the bed of the rivers —

Mr. Bashin sent > let him state what effect he observed

Mr. Hart Q Have you noticed whether or not the raising up of the bed of the rivers — have you noticed the effect

of the raising of the bed
of the river upon the sewage
water in the Sacramento

Mr Belcher I object to the
question on the ground that
~~the~~ ~~question~~ is leading

< Objection overruled >

The Witness I think what
is called sewage water
or ground water I would
call it is higher now
than it used to be in
early days very considerably

Q Higher? A Yes.

Q Have you noticed the
effect of the same cause
upon the sewage of the
City? A It has interfered
materially with the sewage
of the City

Q Now in what respect
has it interfered?

As well the raising of the
water in the lower portion
of the City has interrupted
the flow through the
sewers which we have had
built

Q It as interrupted it?
 A yes.

Q What effect has that had in the sewerage?

A It has detained Sewerage in the pipes and in the sewers

Mr Becher Speaks louder.

A It has interrupted the outflow of the Sewage

Mr Sturt What effect does that have on the flow in the sewers? A In the sewers themselves?

Q Yes in the sewers

A Well it will not entirely stop it but almost so

Q Does it retard it or accelerate it? A It retards it

Q To what extent would you say it retards the current of the flow?

A I could not tell you to what extent. It has to a very great extent. It has very materially done so.

Q How long has it been

Since you have noticed the raising of the sewage water in the ground? As well I noticed it more particularly and perhaps only by some things that I have been doing at times about the house, in digging — digging cesspools for instance. Where I first dug a cesspool I could dig down 10 or 12 feet without coming to water, in midsummer but subsequently I could not go anywhere near so deep before I came to water and was interrupted.

Q State when you first noticed it, about what time? A I cannot tell you the year. I think that the first cesspool was dug there probably in 1855 or 1856 — in 1855.

Q At what time did you notice the raising of the sewage? I guess it

was probably 7 or 8 years ago.

Q What are the material consequences of retarding the flow of the current in the sewers? Any or more as it affects health?

A No sir. As it affects the matter in the sewers themselves

as well the matter of course does not flow out of them. It remains there and is liable to decomposition, undergoing decomposition.

Q State whether or not the raising of the sewage water and the retarding of the flow in the sewers has had any effect upon the public health and if so what that effect has been?

Mr Belcher I object to the question on the ground that it is leading

< Objection overruled

A I think that the effect

X 300

has been evidently at times deleterious

Q Material? And deleterious.

Q Well in what respect?

A As shown by the increase of certain diseases in some years over other years

The Court Confine yourself to the one cause, the retarding of the matter in the sewers.

Mr. Hart And the raising of the river.

The Witness That is the way I understand it

Q Now be a little more specific as to the effects and as to the diseases and particular effects?

Q Well in some years we have noticed more of a typhoid character of fever, a lower grade of fever than we have during others. In 1878 for instance when the lower portion of

the City was flooded there was a great deal of that character of disease, a low form of disease, more than existed prior to that time according to my observation and knowledge.

Q Has the change been in the character of the disease or in the amount?

A I think it has been in the amount of certain diseases you might call it in the character of diseases.

Q Now in the amount of certain diseases, what diseases do you refer to — you say typhoid diseases?

Yes Diseases assuming a typhoid character the zymotic forms of diseases some of them.

Q When did you first notice this change in the character of diseases here?

A I think it has been gradual. I do not think there has been any

abrupt change

Q Now to what particular cause do you attribute this change in disease? what reason?

A I think that the elevation of the ground water level has rendered the soil and the atmosphere above it more damp than usual and that the evaporation going on from this damp soil has created disease

Q As to the drainage what is the difference as to the diseases had before the raising of this water in the Channel and those had since that time

A. The Character of the disease I think we see less true intermittent fever now than we used to, or true remittent fever either

Q Was that last meant as a Correction

A. Yes Sir true remittent or intermittent, they are both strictly periodical. I think the typhoid types of fever have increased -

Q What effect does the stoppage or blocking up of the sewers have? In what respect does that effect the diseases

A. Well it might effect it. Our sewers are not perfect in this town

And when blocked up
they generally overflow
the Cess pools. Even over-
flow and there is a
good deal of foul mat-
erial left upon the
surface of the ground
and then the drainage
water not running off
the soil becomes saturated
with foul matter, the
foul water,

Q How is it that the
raising of the seepage
water or did you explain
that - how does it affect
it?

A. I think by the damp-
ness of the ground

Cross Examination

J.
F. W. Hatch.

Mr W. C. Belcher You received
your degree as a physician
in New York?

A Yes Sir

Q In 1843 }

A I think it was in
1843 — yes I am sure
it was 1843

Q Where did you practice
before coming to California
A. Wisconsin

Q Was that your native
state? A No sir

Q Where? A Virginia
Q You came to California
in 1851? A. I did in
the fall of 1851

Q Whereabouts in Wisconsin?
A. I practiced
on Rock river in Wisconsin
and also on the
Lake, at what is now
called Kenosha

Q You say the American
River at its mouth was
filled up level with the
banks? A. Yes sir it is
now, perhaps above the
bank I have not been
there for some time
but I am inclined to
think it is quite up
with the level of the

bank

Q Is that not caused
by the cutting off of
the new Channel by
this City ?

A. Yes sir to a great
extent.

Q That was cut through
in 1862 or thereabouts
was it, that new Channel
A. I have forgotten now
what year, it was
after 1862 I think

Q That Channel covers
very nearly the front
of the City, the larger
portion of ~~the~~ front of
this city on the American
A The Channel.

Q That new Channel or
Quar ?

A No it is above the
City somewhat

Q Is it above the City
but it covers nearly
the entire City on the
American or towards

the American?

A Yes sir probably it does I have never examined the Cut really, I have never been up to it in fact.

Q It is the natural Order of Things when a Cut off is made like that that the old Channel will fill up is it not?

A. I should think so

Q Wherever a Cut off is made in a river particularly if it be in the Valley, the old Channel will fill up =

The question is objected to =

Q In speaking of seepage you said this seepage was the moisture which was in the ground from some other source or from what other source ground water?

A Ground water, what

We Call ground water
Yes sir,

Q That is what you
mean you do not mean
to state what seepage
is or whence the water
comes which you deno-
ted seepage water but
simply that you find
water here in the
ground at a higher
level now than you
found it in 1850

A. Yes sir I should
say so.

Q That is all you mean?

A. That is what I mean

Q You do not mean
that the water came
from the River, passing
or percolating through
the soil?

A No sir I think
the amount of ground
water is regulated by
the amount of water,
the height of water in
the River partly, and

partly by the rains
 Q Does the water which
 fills the soil in this
 City more or less come
 from the River?

A. I presume it does
 Q Do you know anything
 about it?

A. Well that is my
 opinion that it does
 Q Well I ask you if
 you know anything
 about it

A. Well now I cannot
 say that I know pos-
 itively but I believe it
 to be so.

Q Did it originally
 come through the banks,
 that is under the banks
 of the River, it was
 highest at the bank and
 sloped off gradually
 from the bank?

A. Yes I believe so

Q Don't you know so?

A. Yes Sir

Q Well now when the

Water was up within an
 inch or two of the top
 of the bank, did you
 see the water oozing
 out at any place back
 from the bank two
 or three or ten or
 fifteen or twenty rods?

A. I never examined it

Q You never examined
 at all as to that?

A No sir.

Q New levees have been
 built and the levees
 have stood; did you
 see the water percolating
 through the levee?

A I did not examine

Q You never examined

A No sir.

Q Then your opinion as
 as to seepage water would
 not be worth anything
 even to yourself

A Yes sir it is of
 value in my own mind

Q But it is a matter
 of pure conjecture and

Not based upon either any examination which you yourself have made or which any body else has made for you?

A I have not seen it come through myself.

Q Is it not true that the sewage of this City as nature had prepared it was better than what your board of health has done since, or what the City has done?

A I think not

Q Were there not more sloughs to carry off the water from the City than there are sewers?

A Those sloughs in early days were made —

Q Please answer the question first and then you can make your explanation

A No sir not more

Q How many sewers have you?

A We have every alternate street sewer from the River to thirteenth I believe or perhaps 15th Street and then side sewers running between these along the Alleys.

Q. Those sewers ran down R Street and then down to Sixth to a main Sewer?

A Yes the main Sewer runs down Sixth

Q Now is the grade of those sewers now as great as was the grade of the Sloughs?

A I do not know what the grade of the Sloughs was Sir.

Q Do you know what the grade of the sewers is

A Well very nearly it is less than ten inches to the block

Q Less than ten inches to the block of 200 feet?

A 320 feet I believe it is

Q A little less than ten inches to 320 feet

A It is less than ten inches

Q Now the grade of the sloughs that run through, that you do not know?

A That I do not know sir

Q Well is it true that when you first came here R Street in that neighborhood was pretty nearly of itself, a sort of sink to receive the drainage from the City?

A I could not tell you at that time, I did not examine it

Q You could not tell how it was?

A No sir

Q Well was it so when you first began to observe in regard to that matter? A No it was not

Q Is it true that the building of these streets through the City at Right Angles has very much checked and destroyed the natural percolation of the water through the soil?

A. I presume so

Q You do not know so?

A. Yes Sir I think it has

Q Has it not obstructed the natural flow of water through the soil to such an extent as to raise the water several feet in the ground?

A. I could not say how much it is raised

Q Well According to your best judgement I ask you if that would not be the fact, that the water level in the earth would be by the building of those streets raised several feet?

A Any obstruction to the outflow would necessarily raise the level of the ground water

Q Well is not that very nearly a complete obstruction?

A No not complete

Q The packing of the earth and the building of those streets over them

A Only for a portion of the City - it is a very small portion of the City where the streets have been very much raised.

Q Well would it not be true that the use of a street where it had not been much raised, as a street, would have a considerable tendency to set the flow or percolation of water through the soil?

A Through that portion of the soil for certain

Q Then is it not true that the net work of streets in this City has tended very largely to produce the rise of water in the ground
 A Only so far as it has obstructed the outflow.

Q That is has obstructed the water from getting out is what you mean by that?

A Yes Sir

Q Well is it not true that it has very largely obstructed the water from getting out

A It has to some extent probably.

Q Was the fall of sewers, the grade of sewers any larger in 1860 than it is today in the City?

A I do not recollect when the grade was established I think it has never

been altered.

Q They began to be made in 1860

A When ever they Commenced I do not think the grade has been altered at all, it has not to my knowledge.

Q Then for twenty years the grade of the sewers has been the same,

A I think the grade established by the engineers is probably the same but it has not been twenty years since we have had any very good sewerage here

Q They could have even a better grade now than they could then, could they not?

A. No I think not

Q Is not this part of the City higher now than it was then?

A. Yes but the upper part
 718 is not back of this north of those

two streets here that have been filled up — two or three streets.

Q So that the sewerage has to be arranged with reference to the north part as well as to the south?

A. Yes sir

Q But no change you say has been made

A. I am not aware of any I don't think it could have been made any different.

Q Has any change been made in the grade of the Canal below the City? A Well the Canal has been cleaned out occasionally, I do not know.

Q Has there any change been made in the grade? A I think not. I think in the beginning it was a matter of engineering work observation or calculation

Q You do not know that any change has been made in that?

A. I am not sure that there has been

Q How long is the Canal? A Well I cannot tell the exact length of the Canal itself but the Canal connects with lakes,

Q How long before it reaches the first lake A The first lake is down near Sutterville, about four miles from here, three or four miles below.

Q Well now in 1849 and '50 if there had been a Canal there it would have been filled would it not with water

A I presume it would sir

Q From the flood of 1849 and '50, and it was in fact in 1852 and '3 A. Yes sir

Q It was in fact in

Almost every winter with
exception perhaps of two,
from 1850 up to 60 was
it not?

A. Yes sir pretty near
full,

Q Was it not quite?

A Some years overflowed,
over full

Q That is what I ask
you if it was not more
than full overflowed
with the exception of per
haps two years?

A. I think probably it was

Q Between 1850 and 1860

A I think probably it
was.

Q And between 1860 and
1870 was there but a
single year, the winter
of 1863 and 64 when
it was not overflowed
and the whole country
below that?

A Well I have never
been down there, I did
not go down every winter

to see whether the Canal was overflowed but I think within that time there have been two years when the rain fall was quite small.

Q Well I am not remarking about the rain fall at all, I am asking you about a fact whether that was overflowed or was not. I mean the drainage Canal between 1860 and 1870 if there was any year except the one in the winter except the one of that of 1863-64 }

A Well my own impression is that in 1863 and 1864 this Canal was not - I do

Q I do not care whether the Canal was or not but if it had been there would it have overflowed }

A. It would have been
Overflowed

Q What part of the Canal
do you refer to

A. Below I street I sup-
pose he means

Q Do you know what
the grade of this Canal
is from R Street down
to the Lake?

A. I do not, I cannot
tell you now although
I have heard what it
was I cannot recollect
I think the entire fall
is about six feet

Q In four miles?

A. No not in the four
miles - below town to
the Lower Lake

Q What four miles do
you speak of?

Q I speak of the farthest
Lake at Sutterville, or
Sutterville Lake three
or four miles

Q Between Y Street
and Sutterville?

A He asked between R
Struer to Sutterville I
told him perhaps three
Or four miles

Q How large a Lake
is that?

A. Oh it is a very
small lake

Q Approximately as to
its area

A. Oh I could not tell
you I have never meas-
ured it particularly

Q Well then in 1860 or
at any time prior to
that time if this Canal
had been there it would
have the same effect
upon the material which
was there at the time
of the overflowed, as it
does now would it not—
it would have met more
Or less of it on the sur-
face, the material that
was flowing in it

A. Yes Sir Certainly

Q Then when you speak

Obstructions, was not there about the same obstruction then that there is now to that Canal and to the sewage of this City or would there have been had it been in existence

A Well there were no sewers at that time here

Q There were no sewers then, You built them in 1860, in 1862 I think you said the Canal was not built up to that time?

A. I do not remember the year in which it was built

Q Since it has been built there has been no change

A. Except that it has been cleared out from time to time

Q Well with such a grade it would have required clearing out

from time to time under
 Any Circumstances if it
 had been built in 1850
 it would have required
 Clearing out between that
 and 1860 would it not
 A. I presume it would
 Q. Is not that a Conclusion
 that you Couldn't avoid?
 A. Yes Sir no question
 about it

Q And would with the
 same population would
 require Clearing out then
 as often as it does now,
 Every time when water
 Came over it

A Well it has been filled
 up not only by what
 Comes from the City but
 by washings from the
 Surface.

Q Would it not have
 been filled up by wash-
 ings from the Surface
 in 1852 and 53

A. If it had been there
 probably it would

Q And wouldn't it have been filled up more or less in every winter except perhaps the winter of 1856 and 57 and one other winter between 1855 and 1860

Mr Harr you mean entirely filled up every year
Mr W. C. Belcher I said more or less - there has been more or less deposit every year, it has never been filled up =

Objected to as hypothetical =

Q You spoke of diseases here and that there was less of the intermittent and remittent type now than formerly

A. I said according to my observation there is

Q Is it not true with every newly settled country that the class of intermittent and remittent fevers and diseases of that class is

Very much more Common
in the earlier years of
its settlement than it
is afterwards?

A. It is

Q. And is it not true
that those diseases the
intermittent and remittent
for the most part after
20 or 30 or 40 years
mainly disappear and are
replaced by those of a
typhoid character?

A. I think they become less
as the Cultivation of the
Soil and improvement
generally goes on and that
typhoid type of disease as
you state does take its
place?

Q. That is the Course every
where so far as your
Observation or Study extends
is it not?

A. I think it is

Q. And that is just the
Course that has taken
here is it not?

A That fact has been
observed,

Q That is what I mean
the fact is from your
observation }

A. Yes Sir

Mr Hunt Do you mean to
say that the Changes that
have been made in this
Country are the same
that are always made

A. I understood the question
to mean this, does the type
of disease Change in time
in Countries generally - is
it usual for the malarial
type give way after a
while to the typhoid form
of disease I say that it is
In an newly settled Country
we find malarial fevers
after a while they give
way to fevers of a low
form, more of a typhoid
character,

Mr Dr C Belcher That was true
in Virginia }

A. I do not know about Virginia

Q. I am talking now of your reading as well as your observation?

A. Well I would not like to answer

Q That was true in Wisconsin

A. Well it was at the time I left Wisconsin, we thought that the change was taking place although it ^{really} had not, the malarial form of disease still prevails there

Q But that is the general rule?

A That is a common rule

Q Here is a Lake near the Rail Road here is there not

A. Yes sir

Q Sutter Lake, did that Lake in earlier days have an outlet? A. It did

Q Has that outlet been artificially stopped

A Yes sir

Q Would that lake have any effect upon the height of the water here in the

Surface in the ground

A. Or it would somewhat in its immediate neighborhood probably, I think there is perhaps very little pressure though in the water of the lake

Q Well do you mean to be understood to say that the pressure of the water on the banks produces the percolation of the water through the soil

A. Well I think the percolation of the water through the soil is mainly produced by the absorbent power of the soil, some soils absorbing more than others but there is no question that the pressure of the water in the River Course does have more or less effect I think

Q The lateral pressure

A Yes Sir

Q How far from the bank of the River

would in your judgement
would that lateral pressure
be felt?

A. I could not tell you
Sir I do not know.

Q Is it not true that
the death rate in this
City has been decreasing
constantly for each decade
since its first settlement

A. Well no not constant.
The death has varied in
different years.

Q Well I take it for decades
ten years — the first would
be from 1850 to 1860

A. From 1850 to 1860
there was a very great
decrease.

Q Taking the first ten
years and comparing it
with the second you say
that there was a great
decrease.

A A very great decrease

Q How in regard to the
second and third ten
years

A The second was not so marked, nothing like as great as that between 1850 and 1860, nor has the third decade been so great the difference between the third decade and the preceding one.

Q. Approximately or as near as you can tell it what was the death rate per thousand from 1850 to 1860?

A Well I can give it to you for each year pretty near sir.

Q I do not care about it for years, I prefer it by ten years if you can give it?

A Well I cannot give it from memory

Q You have a table there giving it for each year

A Yes sir

Q That is in your book there?

A. No it is not. I have it for a year

in the book that was presented here.

Q Have you it anywhere in a tabulated form for each year?

A. I think I have in my pocket

Q Is that in manuscript or in print

A. No it is in print a portion of it, and a portion of it is taken from the records of the state board of health, The death rate in 1850 was 50 in a thousand

Q That was due very largely to Cholera?

A. Yes sir

Q. I have it here as a very different figure from that?

A There were 900 deaths in 1850 in the City of Sacramento

Q And what was the population?

A Well we Called it 18000,
they used to suppose at
that time there was
18000.

Q. 18000 in 1850?

A. I do not know how
many there were in 1850.

Q. It was about 6500?

A. In 1852 we used to
estimate the population
18000.

Q. And in 1850?

A. The Calculation is made
on the bases of 18000 —
that was a mistake pro-
bably as to the amount
of the population.

Q. In the paper which
I have before me it is
set down at 6820 as
the population in 1850?

A. I do not know what
it was in 1850, I could
not tell you.

Q. Then you could not
make an estimate per
thousand?

A No sir except that I made it on the bases of 18000.

Q If it was on the bases of 30000 it would have been still less?

A. Yes sir.

Q. You took the bases of your estimate for 1852 or 53? A Yes sir.

Q Now Can you in a very little time even now or at a subsequent time give us an estimate or calculation approximately of the average death rate for the ten years from 1850 to 1860. 1860 to 1870 and 1870 to 1880?

A. In 1860 the death^{rate} was 26.4.

Q What was the ~~pop~~ulation?

A. 16500 by the Census. of that year, there were 236 deaths.

Q The population in 1860 was greater than in 1850? A. No I think not we had a large floating population in 1852 -

2. Then I will ask you again if you have any data from which you can make the figures which I asked for? A. The population, except the census years is estimated, it must necessarily be. I could give you the average, of course and I can give it to you for each year as I have it down now, already calculated.

The Court Do you wish that paper filed

Mr Belcher Yes sir

The Witness I would like it again

Mr Belcher I would like to examine him with reference to that table, to know when the first accurate estimate of population was made, when the count was made, if you know? A. The census, I suppose of 1860 was really the first

accurate estimate, the first accurate count we had of our population, admitting that to have been accurate

Q. That was 16,000?

A. 16,500 within a fraction of it

Q. And then in 1870?

A. In 1870 we estimated our population here at that time -

Q. You had a census at that time A. 16,278.

Q. Did you have any census taken between those dates

A. I think there was no official census. The directories had generally taken the census

Q. They made sometimes a very loose calculation? A. Yes sir

Q. What was the rate in 1870?

A. 25.6

Q. What was the number of deaths?

A. 418.

Q. Since that time has the population increased or diminished? A. It has increased.

Q What in 1880 was it?

A By the census of 1880
it was 21500

Q And the number of
deaths in that year?

A The number of deaths
in that year were 383.

Q 383? Ayes.

Q What percentage?

A The percentage was 17.8
not the percentage but per
thousand

Q The number per
thousand? Ayes.

Q And the year before-
1879? A In 1879 it was
19

Q What was the number
of deaths in that year?

A 427

Q What was the rate
per thousand in 1878?

A In 1878 it was 23.1

Q And in 1877? A 19.5

Q And in 1876? A 15.1

Q In 1875? A 22.4

Q In 1874? A In 1874
it was 16.4

Q In 1873? A 20.1

Q 1872? A 17.6

Mr Start If you have that table what is the use of this examination of the witness?

Mr Beeler Q Between the years 1870 and 1880 what was the relative mortality comparing this City with San Francisco, Oakland and Los Angeles?

A Between what years?

Q Between 1870 and 1880?

A The death rate?

Mr Start Q From what disease?

Mr Beeler From all diseases

Mr Start I do not think that affects the question unless it is diseases affected by the floods and this examination should be confined to a cross examination in relation to the increase of the diseases which you say have been increased

A The death rate in San Francisco differs but

very little

Q During the 10 years approximately the same?

A Approximately the same; not exactly. In Los Angeles the death rate is a little larger than ours or than either of the cities you have mentioned

Q And of Oakland?

A I cannot give you the death rate of Oakland exactly. I have not it here I could give it to you for one or two years but I have not got it here. We have not received reports fully from Oakland and for that reason I cannot give it to you

Q Have you received them from San Jose? And is, with the exception of the last year; that is all

Q How does the last year compare taking San Jose and Oakland? A It is a little larger. I cannot

say with regard to San Jose and Oakland. Between San Jose and Sacramento I may be able to say

Q I did not mean between San Jose and Oakland. I meant between Sacramento San Jose and Oakland.

A My impression is that the depth & rate is rather greater in San Jose

Q Than here? A Yes, in fact I know it is from the reports

Q And in Oakland?

A In Oakland it is very much the same sir

Q Do you know whether in San Jose they have within the last 10 years had more or less of the typhoid character of disease - fever

A Well within the last year they have had some because my reports cover the last year

Q I had forgotten that your reports covered the

last year? A I have only
a portion of the report for
the year before

Q How is that with respect
to Los Angeles? A In
Los Angeles they have
some typhoid fever there

Q And how about Oakland
A In Oakland also.

Q The sewerage of each of
those Cities has improved
within the last 10 years
has it not? A Yes.

Q A very considerable?
A Very considerable

Q Now do you know of
other places, where you
have exact data to go by
where there has been no
change in respect to sewer
age. A Well the sewerage
of most of the towns of
California is very defective
in fact very little attention
has been paid to sewerage
except in a few Cities

Q At Orville, do you
know about that? A I do

not know sir. Orville has every facility for good sewerage

Q Or at Colusa?

A There is no sewerage at Colusa

Q Not as to its character for sewerage but as to the death rate? A There is no facility for it at all

Q Do you know about the death rate there? A I could not tell you. I could give it to you for some of the years that I have mentioned but not all

Q Or, what is the relative proportion of children in the last 10 years in this City and in the first 10 years? From 1850 to 1860 and from 1870 to 1880?

A much greater

Q How much greater would you say? A Well I can hardly say how much greater. I think the children according

to the last census were 1474, the children under 5 years of age

Q Children under 5, 1474

A I think that was the number. No, I am mistaken I think I must be mistaken

Q You may correct that after you leave the stand

A I would like to correct it because I have the figures exactly

Q You may then let it stand for the moment and hand it to the Reporter and let him correct it hereafter

In 1850 there were not half a dozen were there?

A I was not here in 1850

Q I thought you came here in 1850? A No sir

Q I am mistaking myself all the time about that.

A I came the very last of December 1851

Q After you did come Dr, from 1852 on the number of children here was very

small was it not? Ayes.

Q What do you say as to the proportion of deaths in all the children born from birth to 5 years of age? A It is 30 or 32 or 33 somewhere along there - 33 I believe

Q What is the proportion between that and 18?

A It must be very much less, very much less.

Q What would you put the entire proportion at?

A 4 per cent perhaps.

Q About 4 per cent?

Ayes I should not put it any higher.

Q That is 4 per cent more? Ayes.

Q That would make 37 per cent in all? Ayes.

Q From birth to 18?

Ayes.

The Court 4 per cent in the aggregate?

Winstead I do not think so.

A If it is 33 under 5

it ought to be at least 4 per cent more

Mr Belcher And there would be 4 per cent added between 5 and 18? A That is what I should think

Q Making 37 in all? A Yes. 4 per cent between 5 and 18 I said. Perhaps it would be from 30 to 33 per cent under 5 years. The greatest mortality of course is within those years

Q What proportion of the inhabitants of this City are children under 18 and you may give it now generally for the last 10 years

A I would not like to give a guess. It would be guess work with me sir

Q Can you make an estimate that will be something better than a guess including children from their birth to 18?

A I think I could give it to you very easily but I

Cannot give you the figures now. I can get them.

Q After you get ~~them~~^{it}, you can give them to us. What proportion per cent. of the population when you first came here was of men over 50?

A A small proportion

Q In this City? A A small proportion

Q As many as 2 per cent of the population?

A Perhaps there might have been that much but not more. Most of the men were in vigorous life.

Mr. Laddis Alade. I object to that. That is calling for a mere speculation

A It is a mere speculation

Mr. Belcher Q Did you know the people of this City pretty well after one or two or three years acquaintance here in your practice? A Yes.

Q You knew pretty nearly all of them do you not?

A I knew a great many people in town

Q And you could tell by their appearance pretty well whether they were over 50 years of age could you not? A I could form some idea

Q Could you not form a pretty good idea? A Possibly more or less accurate. It would be liable to more or less error

Mr Start I am disposed to admit any age you desire

The Court I do not know that it will require any greater particularity than has already been stated that the rule has become much less

Mr Belcher I do not propose to follow this up except to have this witness corroborate Dr Simmons. If this witness knows the fact he may state it as it has been stated by Dr

Summers

The Witness I will state that I heard Doctor Simmons's testimony on that point and I agree with him

Mr Start You heard the testimony of Dr Simmons on that point and agree with it? Ayes.

Mr Belcher Within the last ten years Dr has there been a considerable amount of scarlet fever? A No sir not a great deal

Q Or diphtheria? A Diphtheria has existed some years more than others.

Q And how will this City compare in respect to either of those diseases with San Francisco in the last decade? A The proportion of death from diphtheria to population has been greater in this City than in San Francisco

Q From these two causes? A Yes.

Q And proportionately? A Not I think from diphtheria certainly; perhaps not from scarletina because we have had but very little, scarletina in Sacramento during the last few years

Re-direct Examination
of
J. W. Hatch

Mr. Hart - Are diphtheria and scarletina affected by the causes that you mentioned in your examination in chief. A. Well we suppose diphtheria to be, scarlet fever, not so much

2. Is there anything in addition to that, that is required in order to produce the disease - diphtheria?

A. In addition to the conditions of soil?

2 In addition to the condition of the soil?

A. Yes sir

2. What is it? A. Contagion

2. Well, is there ^{something} ~~any~~ within the patient to produce the disease?

A. Yes sir, there is a certain state of health which predisposes to the ~~inception~~ inception of such disease

2. What do you call that?

A. Well a debilitated condition of the system or system poisoning

2. Where is the germ of the disease found? A. Well the germ is a theoretical thing which is supposed to exist and probly might have been said to have demonstrated by one or two, but it has never been seen but by one or two persons, but we believe that this disease, diphtheria, like other diseases, to be what is called a germ disease, and that this germ is deposited in diphtheria upon the fauces of the patient, and undergoes its its course there

2. Now the effect then, upon the disease of the causes mentioned in your examination in chief, that is, the rise of the sigmoid, and the retarded flow

of the sewage, would be what? A. I think that the dampness of soil, and the foulness of the surface would favor the development.

2. Would it aggravate or produce it? A. It would aggravate, it would favor its development. I doubt whether it would produce the germs of themselves.

2. You said that in your cross-examination that remittant and intermittent fevers changed to typhoid in new countries as they were settled and the soil developed?

A. I said so; yes sir, they gave place to them.

2. Now to what extent, and in what proportion?

A. Well I cannot say what proportion.

2. Upon what does the extent of the change depend?

A. It depends upon the

cultivation, the changes in the soil, the cultivation of the soil and the elimination from it of the other germs perhaps which produce malarial fevers. Other causes of disease arise too, after settlement.

Q. You said in answer to Mr Belcher, as I understand it, that remittent and intermittent fevers ordinarily change to typhoid?

A. I did not mean to say change, I say they give place to typhoid.

Q. You said as it does here. Do you mean to say to the same extent as here?

A. Well I think a general thing that when a new country is settled, the fevers are of a malarial type, and subsequently we find less of the malarial type, and more of the continued form of fever.

2. Upon what does the amount and extent of those fevers in a community depend?

A. Which fevers?

2. Typhoid fevers that you speak of, say in this county? A. In this city there is more connection between filth and typhoid fever than there is between filth and malarial fever.

2. What can you say if anything, has increased typhoid fevers to their present condition - how does it compare with changes in other places? A. Well I am inclined to think that during some years that ~~they~~^{we have} had rather more typhoid fever than we ought to have had in the regular course of things - some years more than would perhaps have taken place

in other places differently situated

2. Is there any such thing as a germ in typhoid fever?

A. Yes sir

2. What produces a germ

A. Well it is a specific germ, and typhoid fever is communicated by the contagion of this germ, through contagion

2. Well, what produces the germ, do you know?

A. No sir, I do not

2. Where does it come from? A. Well we find it comes from the bowels of typhoid fever patients

2. You do not know where he gets it?

A. He gets it by contagion with some one else

2. Well, does sewage have anything to do with producing a germ of that kind? A. Yes sir, it does

Q. How many deaths occurred in Sacramento from typhoid diseases from June 30, 1879 to the first of July 1880, in Sacramento? A. Typhoid fever?

Q. Yes sir. A. Twenty-two.

Q. How many in Los Angeles? A. I cannot give it to you sir, I have not got it. My report will show, that you have in your hand.

Q. I have a table here from which you can refresh your memory. Mr Belcher That is a table already in evidence.

The Court I suppose this can just as well be read without it, but if you want it as a predicate for something else, go on.

A. In Los Angeles, but one case, I believe.

Q. And how many in Stockton? A. Two.

2. Do you know what the relative population of those ^{cities} places are?

A. The population of Los Angeles is 11,186, and of Stockton 10,288, and

2. And Sacramento?

A. 21,500

2. Can you tell whether or not there is any difference in the climates of Stockton, and of Sacramento, that would have a tendency to increase this disease - typhoid?

Objected to as leading.

A. I know very little difference between the climate of Sacramento and Stockton

2. Can you explain why this great difference exists between the amount of that particular disease in those three localities - any reason?

A. Well it is possible that another year Stockton would be - well, I will make

another statement first - the report from Stockton is not complete for a full year. It only has a little number of months. I have forgotten now how many, but there may have been during the entire year more deaths than two from typhoid fever. In Los Angeles and Sacramento they are complete for the year, but Stockton not, and whether there were any more deaths from typhoid fever there, I cannot say.

2. Will I ask if you know of any reason why there should be any more typhoid fever in one of those localities than the other? A. No, I do not.

Mr Belcher You said that it might be different in another year.

Mr Hart Do I understand, if you know of no reason

why there should be any difference, that you now adhere or do not adhere to your original proposition that the filling up of the river does make a difference? A. I did not understand that question fully.

2. Between Sacramento and Stockton, I said for instance, my question is if you know of any reason for the difference in the prevalence of that disease or typhoid diseases in Sacramento, and those from other localities?

A. I did not understand the full scope of the question when I answered it - I would say this: That I think causes exist here that do not exist in Los Angeles, for instance the sewage is better in Los Angeles than it is in Sacramento,

and they are not subject to floods there, that we are, or the amount of surface water

2. Have you given all the reasons? A. Well that is enough at present

2. You spoke of the decrease in diseases here since 1850, in what kind of diseases did that decrease not exist, or does it not exist, or did it not occur?

A. It does not exist in the continued fevers

2. Those that you said were produced or aggravated by this? A. No sir

2. And have they been increased or diminished since that time? A. I think that class of fevers that I spoke of has been increased since the early days of Farranants

2. What reason do you give for the decrease of other classes, and kinds

of disease? A. Well, with respect diarrhoea, for instance; it was a very prominent disease in early days. The condition of the population is one cause which has decreased it very greatly, their social condition, and the better mode of life, and circumstances connected with hygiene, the hygienic condition of the population.

2. Anything else?

A. Those are the main causes, I think.

2. Had anything been done in this city tending to the decrease of disease? A. Yes the efforts of the Board of Health have done something.

2. What effect has the filling of the river had upon the efforts of the Board of Health to prevent disease in this locality?

Objected to as not re-direct examination, and question withdrawn

Re-crop-Examination of F. W. Hatch

Mr. Belcher You said we regard
to diphtheria that somebody
drew a germ? A Yes sir

Q You never saw one?

A I never did

Q. You have not much faith
that any one else did, have you?

A Yes sir

Q. Who was it that saw it?

A Well, it has been seen by
Several microscopists

Q You started to say that in
another year the ratio between
this City and Stockton or Los-
Angeles in regard to typhoid fe-
ver might be very different?

A I can not say - yes I said
so because I really do not
know ~~how~~ many cases of typhoid
there were

Q Don't you know that typhoid
fevers are prevalent in some
places one year, and in another,
another?

A Yes sir

Q You say that, that is a

Contagious disease, if one person gets it several in the family are likely to have it are they not? A Well, it is contagious only in one sense

I Well, I ask you the question whether several in the family would not likely have it?

A They would be if they were exposed to the special contagion.

I Well, those waiting upon and taking care of the persons sick, are they more liable, or not, to have the disease?

A I do not think it is contagious in that sense

I Not in that sense?

A No sir

I Do you know whether or not in the very year that you speak of, from June 1879 to July 1880 that typhoid fever was reported at Placerville? A Yes sir, they had some

I Did they have it at Virginia City? A I do not know

I Do they have it in any other mountain towns? A Yes sir

Q. And is it now, and has it been common there?

A. There are occasional cases in Placerville every year and in Downieville and through the mountain towns generally, Bass Valley and Nevada.

Q. Is it not true, Doctor - you may first state what is the population of Placerville?

A. I do not know. I think it was estimated somewhere about 1500 but I have forgotten exactly.

Q. And there there were four deaths, then the rate was greater than here?

A. I did not say four deaths, three or four, I can not tell you exactly the number, I think it was in the report - that is correct according to my reports.

Mr. Catlin Look at it and see whether there were not four deaths at Placerville at the same time there were 22 deaths in Sacramento?

A There seems to be from Mr Belcher Is not that a considerably greater proportion to the thousands than there were in this City? A Yes sir

Q How many were there in San Francisco between the same dates? A 85

Q How many of typhus and typhoid both in San Francisco at the same time or between the same dates?

A There are 15 put down as typhus and 85 as typhoid

Q There are 100? A Yes sir

Q How was that percentage as compared with the percentage of Sacramento?

A I think it is greater.

Q Greater in San Francisco than here, or greater here than in San Francisco?

A I have not made the calculation but it strikes me that it is greater in accordance with the population

Mr Hart. Greater here than in San Francisco? A No sir

The population is put down at 233,000.

Q That would be ten times as big as this City

Mr. Belcher The proportion would be less? A Yes sir

Q But when that disease commences in any place, it is very likely to continue - that there will be a good many cases of it, will there not?

A No, I think not, not necessarily so.

Q How do you mean then that it is contagious, Doctor?

A There is but one source of contagion and that is through the discharges of the bowels of a typhoid fever patient.

Q Then it is not true that those waiting upon a sick person are more liable to contract the disease than others?

A Well, with ordinary care they would not be so, because it is usual to disinfect the discharges as they are passed, and have them removed.

Q. Taking all fevers?

A. They would not be likely to receive the germs in their systems there by simply waiting on the patient.

Q. Taking all diseases, all fevers in the first ten years, and all the fevers in the last ten years, in which ten years was there the greater proportion?

A. Of typhoid fever

Q. Of all fevers?

A. Oh I do not know sir. I cannot tell you

Q. Don't you know that from the time you commenced practice there were a very much greater number of fevers in proportion to the population before 1860 than there has been since 1870?

A. No, I think not. There was perhaps more ague and intermittent form of fever, but not of other forms

Q. Well, I take all forms

of fever? A. Well, I say of a single one there was an excess then, but I think not of the other forms

Q. Well were there not at that time 10 intermittent fevers and remittent fevers to where there is one of a typhoid character now?

A. Well, I think so

Q. I want to know if the ratio of typhoid fevers here in this city is greater than it is for the State of Wisconsin for the last year; is it greater than it was in Massachusetts

A. I could tell by referring to the record of the State Board of Health of Wisconsin -

Q. The figures that you were to have made -

A. I will give to the Reporter in the morning

Mr Cadwalader The statement of the rainfall for 31 years is admitted to be correct, and is as follows:

RAINFALL FOR THIRTY-ONE YEARS.

The following interesting and valuable table of the rainfall at Sacramento for thirty-one years, or thirty-two "seasons," last past, was compiled by Sergeant Barwick, United States Signal Corps, at this station. The data for the years from 1849 to 1862, were obtained from records kept by the late Dr. T. M. Logan; from 1863 to June 30, 1877, from observations and records of Dr. F. W. Hatch, and the remaining years from the signal office. The average rainfall for the thirty-one calendar years, computing the years from January 1st, was 19.46 inches, and for the thirty-two seasons, computing from August 1st to the same date of the following year, the average was 19.82 inches, only a difference of .36 of an inch from the former:

YEAR.	January	February	March	April	May	June	July	August	September	October	November	December	Total for year	Season of	Inches
1849									25	1.50				1849-50	36.00
1850	4.50	.50	10.00	4.25	.25	none	none	none	none	none	spring	spring	19.50	1850-1	14.71
1851	.65	.35	1.88	1.14	.69	none	none	none	1.00	.18	2.14	7.07	15.10	1851-2	17.98
1852	.58	.12	6.40	.19	.30	none	none	none	spring	none	6.00	13.41	27.00	1852-3	36.00
1853	3.30	2.00	7.00	3.50	1.45	spring	spring	none	1.00	spring	1.50	1.54	21.29	1853-4	21.06
1854	3.25	8.50	3.25	1.50	.21	.31	none	spring	spring	1.01	.05	1.15	19.83	1854-5	18.62
1855	2.67	3.46	4.20	4.32	1.15	.01	none	none	spring	none	.75	2.00	18.56	1855-6	13.76
1856	4.92	.69	1.40	2.13	1.84	.03	none	none	spring	.19	.65	2.40	14.25	1856-7	10.43
1857	1.37	4.80	.67	spring	spring	.35	none	spring	none	.65	2.41	6.63	16.88	1857-8	18.98
1858	2.44	2.46	2.88	1.21	.20	.10	none	spring	spring	3.01	.15	4.33	16.78	1858-9	16.02
1859	.96	3.91	1.64	.98	1.04	none	.03	none	.02	none	6.48	1.83	16.89	1859-60	22.65
1860	2.31	.93	5.11	2.87	2.49	.02	.59	none	.06	.91	.18	4.28	19.75	1860-1	115.53
1861	2.67	2.92	3.32	.47	.59	.13	none	none	none	spring	2.17	8.64	20.91	1861-2	311.57
1862	15.04	4.26	2.80	.82	1.81	.01	none	.01	none	.35	spring	2.33	27.43	1862-3	235.55
1863	1.73	2.75	2.36	1.69	.35	none	none	none	spring	none	1.49	1.81	12.18	1863-4	7.78
1864	1.08	.19	1.30	1.08	.74	.09	none	.08	spring	.12	6.72	7.87	19.27	1864-5	522.51
1865	4.78	.71	.48	1.37	.46	none	spring	none	.08	.48	2.43	3.84	11.15	1865-6	617.93
1866	7.70	2.01	2.02	.48	2.25	.10	.02	none	none	spring	2.43	9.51	26.52	1866-7	725.30
1867	3.44	7.10	1.01	1.80	.01	none	none	none	.01	none	3.81	12.84	30.03	1867-8	832.79
1868	6.04	3.15	4.35	2.31	.27	spring	none	none	none	none	.77	2.61	19.50	1868-9	916.64
1869	4.79	3.63	2.94	1.24	.65	.01	none	none	spring	2.12	.85	1.96	18.19	1869-70	13.60
1870	1.37	3.24	1.64	2.12	.27	spring	spring	spring	none	.02	.58	.97	10.21	1870-1	9.43
1871	2.07	1.91	1.69	1.45	.76	spring	spring	none	spring	.21	1.22	10.40	19.91	1871-2	223.56
1872	4.04	4.74	1.84	.61	.28	.02	none	none	spring	.22	1.94	5.30	19.08	1872-3	314.26
1873	1.23	4.37	.55	.51	none	.04	.01	spring	none	.31	1.21	10.01	18.24	1873-4	422.40
1874	5.20	1.36	3.05	.89	.37	spring	spring	none	.05	2.26	3.80	.44	17.42	1874-5	623.70
1875	8.70	6.55	.80	spring	spring	1.10	none	none	none	.44	6.21	none	23.80	1875-6	520.15
1876	4.79	3.05	4.16	1.10	.19	none	.21	.02	spring	3.01	.32	none	16.85	1876-7	9.10
1877	2.77	1.40	.56	.18	.64	.20	spring	spring	none	.73	1.07	1.44	8.99	1877-8	824.87
1878	9.26	8.08	3.09	1.07	.17	none	none	none	.29	.55	.51	.47	23.45	1878-9	917.85
1879	3.18	3.88	4.88	2.66	1.30	.13	none	none	none	.88	2.05	3.41	22.37	1879-80	26.47
1880	1.64	1.83	1.70	14.20	.76	none	spring	none	none		.05	11.81	31.99	1880-1	126.57
1881	6.14	5.06	1.37	1.64	spring	.50	spring	none	none				14.71		

Testimony
 of
 J. G. Tyrreld
 Called for Plaintiff Sworn

Mr. Cadwalader You are a Physician and Surgeon? A Yes sir

Q How long have you been in active practice? A About 25 years.

Q How long have you been in active practice in this City

A From 1868.

Q What positions have you held upon Boards of Health, local and state, if any

A I have not held any position in Boards of Health, sir

Q Neither State nor City?

A No sir

Q What connection have you had with the State Medical Society? A I am the President of the State Medical Society at present

Q I will ask you if since you came here in 1868 you have noticed the deposits of

Mining debris which surrounds this City and which to some extent are found within its limits

As they have been occurring. I have noticed them, yes sir

I will ask, if at all, wherein those deposits contain any elements of disease, the fresh deposits of mining debris

As they contain elements of malarial disease, being spread out upon the land

I have you noticed what effect the filling of breeding lots in this City with this debris has had? - a My Experience of it has been that it has always produced malarial fever wherever it has been filled in, either the street or the lots, very soon afterwards

I will ask supposing you wanted to increase the death rate from typhoid fever in a City like this previous to these deposits, or a city like San Jose where there are no such deposits, or like Los.

Angles or like Oakland, how
would you go about to do it—
what would be the best means
to improve the death rate

Objected to and objection
sustained

2 I will ask you if you have
noticed any difficulties growing
out of the obstruction of the
sewage of this City and sur-
rounding lands by sewage or
back water

Objected to and objection
sustained

2 I will ask you whether you
have noticed any obstructing
to the passage of sewage in this
City? A I have, sir

2 What in your opinion has
caused them? A. The filling
up of the river has caused
the obstruction to the running
off of the sewage water

2 What is that you call the
sewage water? A Water
that has percolated through
the soil from the river as
well as that brought down

From the uplands

Q What effect has that had upon the health of this City and Surrounding Country.

A Well, in the City I think it increases the zymotic diseases Especially typhoid fever. The effect, so far as my experience goes outside of the City, in the outside lands has been the increase of malarial fever.

2 Increase of malarial fever outside? A Yes sir,
2. And the increase of typhoid in the City? A. Typhoid or zymotic diseases in the City that is altogether owing to imperfect Sewage, imperfect drainage

2. State what your observations are? A Well, my observations are that the want of drainage - the drainage is so very slow from the City that it allows all these noxious matter to accumulate and then when the warm weather

Come on the heat with the moisture it produces this form of Endemic disease; if we had good drainage and plenty of room for those Accumulated matters to drain off, I think the City would be much healthier.

Q What do you have to say about where this sewage water comes from? A It comes from the left of the river percolating into the City, being lower than the bed of the river really.

Q Is it increased or diminished by the increased height of the river bed? A By the increase in the height of the river bed.

Q How is this disease of the typhoid character as to growth? A Well, typhoid is produced by a germ deposited from the bowels generally and being then carried and disseminated through the air subsequently through this sewage.

water welling up through Pri-
vies and other places carrying
the detritus up to the surface
and leaving it there

Q Has that disease been in-
creasing or diminishing during
late years? A It has been
increasing.

Q How does it compare in
faeramento with other Cities
in the State such as Los An-
geles and San Jose?

A Well, from the tables I see
that it is very much more
in faeramento, than in Los An-
geles, or San Jose or Stockton

Q What do you say about
this state of things in the
City or out, holding on to the
malarial disorders, retaining
them? A I do not un-
derstand you

Q Well, I do not make my-
self understood — Suppose that
there had been no debris here,
no raising of the water chan-
nel surrounding this City
or in the neighborhood of the

City, but that the cultivation of the Country had gone on in the usual way, what would have become of the malarial order in the Valley

A. Well, they would disappear in a great measure.

Q Now what effect as to their detention or holding on of that which has been produced by the debris in the City and outside of the City?

A Well, it has increased there the malarial disorders in my experience outside of the City. In the City I do not know that there is any increase more than ordinarily have found here in the last thirteen years I am speaking of.

Q. Has there been any diminution

A. No diminution that I know of

Q What do you say about the condition of things of which I have spoken preparing the System to receive all sorts

of disease - what effect does this state of affairs have upon the system - the raising of the water channels, the submerging of the adjacent lands with sand and the increase of the spray water and the obstruction of the flow of the sewage water?

A Well, it increases the tendency to take disease, malaria that incessantly comes from overflowed lands, makes your system more susceptible to those diseases - it impairs your constitution - malaria impairs your constitution, and makes you much more liable to the reception of other and more malignant diseases.

2 What would you have to say about these diseases operating on the mind, or body, or both?

Objection to a leading

2 To what parts of the system would the effects spoken of by you extend? A. It generally affects the liver and spleen

Recess until tomorrow at 9.30 AM

In the Superior Court
of the State of California
in and for the County of
Sacramento

The People of the State
of California } Morning Session
vs. } Saturday
The Geo Run Ditch } Dec. 10th 1881
and Mining Company }

Transcript of Testimony
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Winfred J. Davis
Official Reporter

In the Superior Court
of the State of California
in and for the County of
Sacramento

The People of the State of California vs. The Gold Run Ditch and Mining Company	} Morning Session Saturday Dec. 10 th 1881
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Testimony
of
J. G. Robinson
called for ptty. sworn

Mr. Cadwalader Mr. Robinson:

At my request did you proceed
to the Gold Run Mine and get
some specimens of the gravel bank
there? A Yes sir

Q Where are they?

A This is one (showing)

Q Robinson No. 1?

A That is the sample

Q What is marked Robinson
No. 1 is a sample? A Yes sir.

That I took from the Goes Run Mine.

Q What part? A. The upper bank. The red material on the surface.

Q Which is No. 2?

A That is No. 2 (showing) Reporter Davis marked how?

a. Robinson No 2

Mr. Cadwalader Where is that from? A That is taken from the bank below the red surface

Q From what place on the bank? A What place on the bank?

Q Yes sir? near the foot?

A It was taken on the Eastern side

Q In the pit? A It was taken on the Eastern side of the pit

Mr. Belcher Of what?

a. Of the pit

Mr. Cadwalader Did you bring any specimens from the mine in the neighborhood of Lower Hill, on the other side of the

divide? A I did

Q Where are they?

A I have not got them here

Q Then I will dismiss you for the present? I wish you would bring them here with you?

A I will

Crop - Examination
of
J. G. Robinson

Mr. Belcher Mr. Robinson:
You say that No 1 is red
Earth that you obtained where?
A From near the surface
Q Whereabouts? Whereabouts
with respect to the town of
Goed Run? A It was in
the neighborhood of Goed Run.
Do you mean the station or
the mine?

Q I said, the town of Goed Run

A As to the town of Goed Run
it would be south-east.

Q That is from the surface
soil?

A Yes sir

Q That you took there?

A Yes sir

Q Reddish? A Yes sir
Q And the second specimen?

A That was taken on the bank
just below that

Q On the East or the West
bank? A On the East bank

Q And how far under the
reddish soil? How deep down
from the natural surface of
the ground? A About 25 feet

Q About 25 feet? A Yes sir

Q That is within what is
called the upper or surface
wash? A Yes sir

Q And how far down below
the town of Galo Run was
that? A About $\frac{3}{4}$ of a mile

Q That is a single specimen
of each? A Single specimen of
each mine? A Yes sir

Q Did you select them with
care? A I took them

just as I dug them from
the bank

Q In some particular place?
A Well, I —

Q (Int'g) The one under

the other? A. One very
nearly under the other

I and both on the east
side? A Yes sir

I Close to Cañon Creek?
on the side of Cañon Creek?

A Well, it was in the
neighborhood of where the
Deer stands

I Is it on the side of the
Cañon Creek? A Yes sir

I Well, then it is not from
the place spoken of here as
the pit? There is a circular
or comparatively circular
opening there, below the up-
per or surface washing?
It is not out from that pit
at all? A Not from

the lower pit at all; no
sir

Mr. Cadwalader What pit
is it from then

A It is from what would
be considered the upper workings.
That is, if you will allow
me to explain?

Mr. Cadwalader Certainly

9. The lower pit, or what we call the deepest workings are farther down. Then there is another, level or bench where the pipes and the giant now stand.

From the pit workings where most of the workings are done. These were taken from the surface. From where I call it about the center of these workings and the bottom of these works.

— " —

Testimony of G. F. Allardt

re-called.

Direct Examination

Mr. Hart. State what you know are the standard text. books on the subject of hy draulics?

A There are quite a number. I made a list of what I could remember, that I will give; a list of the books that are usually relied upon. I have it with me. Shall I read the names of the authors?

Q Yes sir.

A. Weisbach's Mechanics.
Lowell's Hy draulics Experiments. Mass-
achusetts by J. B. Francis.
He has made some very elab-
orate Experiments on the
flowing of water. That is
probably one of the best
authorities on that branch

Rankine's Engineering.
That embraces the entire sub-
ject of Engineering including
hydraulics.

De Conte's Geology - a
~~new~~ ^{old} work, comparatively
D'Aubesson's Hydraulics,
Mississippi River. By
Humphreys and Abbott. A
work carried on under the
authority of the Government
of the U. S. A work carried
on by the Engineer Officers
of the U. S.

Box's Hydraulics Tables.
A rather recent work, a
good authority

Neville's Hydraulics
Trautwein's Civil Engineering
Hagen on Rivers. A German
work.

That is all that occurred
to me at the time

Crop-Examination of G. F. Allard

Mr. Belcher Now Mr. Allard:

do you mean to say, that
Le Conte is an authority on
his drawings? A He is
an authority on classification
of material in rivers

Q Is he anything else or more
than a collector from others
of such facts as have oc-
curred or appeared to him in
his reading? Transferring
them to his book? Is he any-
thing else? Has he ever made
any original investigations
whatever? A I can not say

I don't know that he
has not? A I don't know

Q You don't know whether he
has or has not? A No sir

Q Is there anything that ap-
pears in his book, that shows
any original investigation what-
ever? A No original exper-

iments. But I suppose he has

made original investigations

Q Why do you suppose he has made original investigations?

A I think he has

Q Does he say so?

A Investigation as to the Law

Q Does he say so?

A. I understand him so

Q Does he say that he has made any original investigations

A I think he has of the laws of mechanics

Q Does he say so in his book?

A I think so. It is a large book

Q. Have you read his book?

A Yes sir

Q Do you find there that he says that he has made any original investigations or any mathematical investigation in regard to the laws of Engineering either of bydraulics Engineering or of Engineering generally?

A It is difficult to say -

Q <Intg> Please answer my question

Mr Hart. He is going to answer

your question

A It is difficult to say what is original in a book. One book is a copy of another in many respects. There are very few authors who do not depend more or less upon others. The experience of one single person amounts to very little in the preparation of a book. And I am not able to say what is original and what is not original in Le Conte's Geology.

Mr. Belcher I suppose the book states correctly what its contents are?

A I suppose so. As to finding out, or telling you if he has made anything in the way of original investigations himself, I cannot tell you. I cannot tell you as to any experiments by him.

I do you know about that?

A I cannot state as to experiments. I cannot not

I You leave out of this list one book which you mentioned when you were on the island

Before? in the preparation of tables you gave Dubois ^{du Bois}? Why did you leave that out of this list?

A It is merely an oversight. I certainly should add his work. There is also the work of Poncellet. He has made experiments. I didn't recall his name at the time. I can't name them all. There are a great many

Q Now of these authors whom you have named - Frank-ven for one - do you know whether they have, or whether he has made any original investigations. Or have they simply assumed what is found in other works?

A Frankven has a number of tables on his draughts

Q Can you answer my question?
A I am answering your question

Q I don't think you are
A Well, I will see if I can

Q Has he made any original investigations? A Well, yes sir, I think so.

Q What are they?

A He claims to present original tables on his draughts as I understand. Therefore I judge that they are tables which are original with him.

Q Are they not the tables of Dubois ^{Bois}? Is it not the fact, is it not true that Dubois tables are the tables which have been followed by all authors who have used tables of that class since his time?

A I think he has quoted from him, on one branch of the subject. I know he is quoted from very generally. That is, ^{on} the transporting power of water. He made many experiments on that subject.

Q Dubois did? A Yes sir.

Q Is it not true that all

his Experiments were made in a trough of plain wood? Having a plain smooth surface of hard wood? Is it not true that all his Experiments were made in that trough?

A Very Probably

I Dont you know that is so
A I think that is so. I have forgotten. I believe that I read him at one time

I Now you speak of D'Au-
lissou? Is that a work of
original research or is it
a compilation?

A That is one of the principal
Authorities. I really can not
state whether that is a
work of original research or
not. I suppose that it is
in part, of course.

I you give that as a sup-
position without making any
direct statement in regard to
it?

A Just what I say

I. As to Rankine's Engineering
Is that a work of original
research, or is it a compilation

Q It is both; undoubtedly

Q Why do you say undoubtedly?

A Rankine was a professional man; a professional Engineer. And he gave his own experience along with that of others.

Q Does that appear in his book? A I think that it does.

Q Does that appear in his book?

A It does, according to my recollection.

Q Now as to Box's hydraulic tables? Now is it not true that he simply adopted the tables of Duboutet and the tables of others? And that so far as his book is concerned he says that he made no original research whatever?

A I think that Box did. Box's book is a recent work. He has modified the tables somewhat.

Q Has he modified Duboutet's tables at all?

A I cannot say. The book will show for itself.

on that point.

2 Is Nevills Hydranthei, a book of original research or simply a work of compilation? A That I cannot not say.

2 As to Hazen on Rivers is that a book of original research or a mere compilation?

A I think that is a book of original research; as I read it. It is rather a recent work on Rivers.

2 Now is it not true, that pretty nearly all of Hazen's work is merely a compilation of what others have said in regard to rivers?

A It may be. I don't know how far his own personal experience enters into the book.

2 Is it not also true, Mr. Allardt in regard to Dubois's tables: that very many misprints were made in the original tables?

And that these misprints have been transferred to the tables as reproduced by others? And that these very tables themselves show that they have not received any careful Examination from the printer seeking to use them, after him.

A I never heard of that. I can not answer that. They are very old: those tables.

I have you not Examined them sufficiently to know that there are many errors in them? A No, I have not. I have never observed any palpable error in them; and that were apparent.

Mr. Hart Is there any other work, Mr. Allard, on the subject of hydraulic mining that is accepted as an authority or text book?

A There is a work on that subject which I have not mentioned. I can not say whether it

Bowie

is accepted as an authority or not. It is a compilation in part like Every other work of the kind. It is Bowie on Hydraulic Mining. How much of that work is original, I do not know. I do not know that work is general use.

Copies are rather rare. It is referred to from time to time. I do not understand that it is a text-book at all; that is, a school book. But I believe it is the best we have on the subject, in print; — the best compilation

Testimony of Dr. G. G. Tyrell resumes

Mr. Cadwalader Any other
part of the system?

A The effect of malaria on
the system, it affects the
system generally, when ma-
laria affects the system
at all.

Q I believe you said that
typhoid was contagious did
you not - I will ask you
whether typhoid ranks among
the contagious diseases?

Objects to a leading and
suggestive

Q. State the characteris-
tics of this disease?

A Typhoid fever is essentially
a filth disease, it is the
product of filth and especial-
ly sewage. It is an infectious
disease more than it is an
contagious disease, that is
to say it can be carried in

soiled clothing, soiled linen,
or in pure water or milk or
sewage and conveyed to the
body through the air, or through
the lungs or through the stomach.

2 What part of the system
does it affect? A The
force of typhoid fever is ex-
pended as a general thing
upon the bowels, secondarily
of course, it may affect the
nervous structures.

2 Have you described the man-
ner in which it produces
infection entirely, describe
the manner

Objected to as suggestive
2. The point is that it comes
from the excrement of the
human body and is deposited
in the cess-pools

The Court. Unless there are
different theories on the subject,
having explained that already
by Dr Hattel, I think it is
enough

Mr. Cadwalader Now I am
asking the Doctor if he has

given the full definition —
 That is if he has fully described
 the manner in which it has
 produced infection. He said
 it was found in sewers
The Court. Sewers and filth.
 I suppose that would be
 enough. That was explained
 by Dr Hatch and unless there
 are different theories I suppose
 it is hardly necessary to go
 into it again.

Mr. Cadwalader state if
 you please what the effect
 would be of saturating the
 soil of this City with water.

A The effect of saturating the
 soil, would be the bringing
 up of this dead organic or
 decaying organic matter —
 bringing it to the surface
 and consequently increasing
 the foci of disease — In-
 creasing the extent of the
 disease germ.

I have you observed what
 is called the sewage water in
 this City. I have

I Just describe what it is and its operation. How it appears on the original surface in this City, that is the parts of the City that have not been raised.

A As the river rises the water rises in the City, and it comes up with it all the contents of cess-pools and privies and so forth and spreads them over the ground and as the river recedes the water recedes with it and leaves all these foul exhalations on the ground.

I Do you know how near this sewage water in the winter and spring or during the freshet time comes to the surface on N. Street where you live? A Well, in the last year it came to the very surface on my lot, I am much higher than the ordinary lot, too.

I Where is your lot?

A On N. between 6th and 7th.

Q. The block below where I live? A. Yes sir.

The sewage water then was just to the surface of the ground. Below me it was 2 or 3 feet above the ground.

Q. What would you have to say about the influence of this decomposed or decomposing organic matter, increasing or decreasing as it nears the surface?

A. It increases as it nears the surface, the nearer it gets to the surface the more danger there is of an epidemic disease being produced by it.

Q. What do you have to say about the drainage of the City when the sewage water is so near the surface?

A. Well, the drainage is almost completely obstructed in that case. It is completely obstructed in fact when the City is filled with water.

Q. How often have you noticed that in the last 3 or 4 years

here? A. Oh; I have noticed it several times in fact in the lower part of the City. Every corner there is an obstruction to the drainage.

Q When you refer to the lower part of the City what part do you mean?

A I mean from N street down to R street and R street to the inside levee.

Q And what section of the levee? A Well from 6th St down to 2nd St.

Q Well, is your lot on that part? A No sir my lot is between 6th & 7th. I am just above that area block

2. ~~the~~ And how much above, I mean how much is high?

A I am above that 3 feet at least - yes at least 3 feet

Q Do you recollect the Local Break?

A I do.

Q What Effect did that have upon the drainage of

Our City? a That com-
pletely obstructed it?

Q For what length of time?

A It filled the canal for
several months I think
for 3 or 4 months. I am not
quite sure, I believe it was
3 or 4 months

Q What effect was noticeable
if any of that obstruction
of sewerage? A That
year we had a large increase
in typhoid fever cases

Q To what extent?

A Well, I think there were
22 deaths that year of ty-
phoid fever, I think it was
22 deaths, deaths that
there were from typhoid fever
that year, I am not sure,
I think that was death

Q What effect did the
Fern and Messick Creeks
have upon the sewerage of
Our City? A That was
1881 - well, that also ob-
structed the sewerage here

Q Do you know upon

What grade the Sewerage
of a city can be run
off — the minimum?

Mr. Belcher I object to that.
It is not shown to be an
Expert

Mr. Cadwalader Have you
studied this subject and
Examined into it?

A I have not so, sufficiently
to give an opinion, but I
think a very small gradient
would carry off fluid

Q What was the effect if
the fluid of the Sewerage is
held back by the obstruction
on the drainage?

A It increases the area
of disease germs, because
in fluid Sewerage there is a
great quantity of disease
germs in fluid

Q Have you noticed the
building of privies and cess-
pools here? A Yes sir

Q The extent to which it has
been going on? A I have

Q And the reason for doing

doing it? A Yes, there is only one reason why they should do it. There is only one reason why they should increase the number of them, there is no other way of getting rid of the Sewage.

Q What is the tendency of the building of vaults and Cess-pools? A Well, the result is, the complete saturation of the ground with Excrementitious matter and Sewage matter.

Q Well, what is the tendency of that? A To increase disease.

Q To what extent and towards what form? A Well, the tendency is to increase typhoid disease, zymotic diseases of all kinds, diphtheria, scarlet fever, and other zymotic diseases, filth diseases as they may be called.

Q I want to direct your attention towards Epidemics. What do you have to say

on that subject?

A Well, the tendency to an Epidemic is much increased by the saturation of the soil of the Excrementitious Matter, Sewage matter, it renders us much more liable to an Epidemic than we otherwise would be

Q What do you have to say in regard to wells, drinking well water and using well water?

A. You dare not drink any well water in this City

Q You dare not?

A Not with any degree of safety

Q Why?

A From the saturation of the soil with this Sewage and sewage and Excrementitious matter

Q. What have you to say in

regard to the disturbance
of this saturated soil?

A Every time that saturated
soil comes be disturbed the
tendency comes be augmented
disease, the production of disease

Q What kind?

A Typhoid, diphtheria and
zymotic diseases generally

Q What has been the nature
of the efforts here in the last
4 or 5 years to restrain or pre-
vent the spread of disease in
this City?

A The Board
of Health have used every
precaution they could in the
way of building sewers and
having them thoroughly flushed
and in fact using every san-
itary precaution that could be

Q How in regard to privies?

A Oh! They are cleaned out
by ad-hoc excavators and so
forth, thoroughly cleansed
as far as possible

Q. How with regard to tapping them? A. The sewers?

Q. No they privies

A. Well the privies are generally in the yard. I do not know what you allude to, house water-closets do you, or to the trapping into the cess pools from the house water closets

Q. No, sir, I am referring to the regulations of the Board of Health

Mr Belcher What the Board of Health may have regulated, I take it is not important here

Mr Gadwalader The precautions taken by the Board of Health?

Mr Belcher Nor the precautions taken by the Board of Health. It is the fact that is to be proved

Mr The Court You want to describe the connection between the closets, and

cess pools, with the sewers
Mr Cadwalader I want
 you to describe the man-
 ner in which privies
 are regulated by the Health
 Officers of this City

Mr Belcher Whether they
 be regulated by the Health
 officers or by somebody
 else, I take it as a matter
 entirely of no value here

Mr Cadwalader Well, in
 fact?

Mr Belcher I object to
 that question

The Court Ask him how
 they are arranged as a
 matter of fact, describe
 the arrangement of the
 water closets and privies

A. I know they are
 thoroughly ventilated -
 most of them by a patent
 process, about the traf-
 ficing of privies out-
 side I am not famil-
 iar with, in the yards

Mr Cadwalader Well what

does the Health Officer do?

Mr Belcher I object to that. It is immaterial what he does

Mr Cadwalader, In fact?

A. He inspects them, and sees that they are properly cleansed, as far as possible has them disinfected by disinfectants

Q. Now in regard to flushing sewers with water?

A. Well, the sewers are flushed occasionally. I do not know in fact that the sewers are flushed, but when they flush the water mains, it runs into the sewers, and partly cleanses them, but the sewers are generally cleaned out by men going down the man holes, and scraping them out - the larger sewers

Q. What is the effect of retarding the sewerage

from a city?

A. The retardation of the flow causes a deposit of the more solid organic matter in sewage, and of course increases the saturation of the soil, and the tendency to epidemic influence.

2. What is the effect of depositing upon arable land this sediment?

A. It produces malaria. Mr Belcher That is a matter which you inquired about yesterday by this same witness.

Mr Cadwalader What effect upon the health of any part of this city, has this overflowed section, this section lying between the American River and the north levee?

A. It produces ague, and intermittent and remittent fevers.

2. In what portion of

the city? A The north part of the city especially

2. Well, how noticeable is it there? A Well, along C. street in the fall, you will hardly find a house that has not some one or perhaps the whole family sick with ague

2. How far is C street from this north levee?

A. About a block from the north levee

2. What effect does it have upon the renting and selling of property in that part of town.

Object to as immaterial

The Court - If it renders it uninhabitable, I suppose the testimony is relevant

Mr Cadwalader State what effect if any, it has produced upon the habitability of that part of the city? A Well, it is practically uninhabitable except to those who have

been acclimated there for many years

Q. And what do you attribute that to?

A. The malaria, myasma coming over the levee

Q. I want to ask you this question, that is as ~~the~~ to the death rate from typhoid fever, as compared with other cities? A. Well I am not familiar with the statistics of the death rate, except what I hear that the death rate from typhoid exceeded that of San Francisco or Los Angeles, or Stockton

Q. What has been done with this drainage canal since 1878 - since the Love dall flood? A. It has been dug out, and deepened and widened

Q. Do you know where that crosses the river side road? A. Yes sir

Q. About where?

A. I think it crosses it about Flint's Ranch

2. Have you seen that canal flooded or filled up, except after the Lovedall breaks here, in the last 10 years? A. I have, yes sir

2. When? A. Well, I could not exactly state the years, but I have seen it filled up. I think it was cleaned out before the Lovedall break - deepened

2. Well has it been filled up since the water from the Lovedall break ran over it? A. Well, I am not positive about it, but I think it has been filled up - I think it was filled up, with the Messick break last year

2. From the Arm and Messick breaks? A. Yes sir

2. Do you know of it being filled up at any other time for the last

10 years?

Mr Belcher He has already stated that he had Mr Cadwalader I want to get at that particularly

A. I have known of it being filled up, but I do not know exactly when it was

Q. Do you know of the extent that that was enlarged since 1878? A. I do not know the exact extent. I know it has been widened and deepened very much more than it was

Q. Where did you say it crossed the riverside road? A. Flint's Ranch, just at the entrance of Flint's Ranch

Q. Do you know the dimensions of it?

A. I do not know the dimensions of it exactly

Cross Examination of G. G. Pyrell

Mr W C Belcher Have you given some attention to the Character of the soil and the formation of the land upon which the City stands ?

A. Not particularly No Sir

I Never have given any attention to it - haven't you given enough attention to know that the portion of the City which you have been speaking of here and that below it through which the drainage of the City is carried passes is a sort of trough having its head just a little ways south of the American River and then passing along down parallel with the Sacramento ?

A. A Trough - I was not aware of it No sir

Q. Well sir whether you are or not suppose we should take a piece of paper and folding it up like that ~~illustrating~~, Call that the American River, the American Comes in here and the Sacramento this way Coming in at right angles to one another

A. Yes sir

Q. That is the fact?

A. Yes sir Very near

Q. In regard to those two rivers, now then has the natural drainage from the City Commencing a little Southward from the American - taking the original surface now - I am not taking this filling at all but the original surface from the banks of the American River, had

a Constant flow southward
had it not — all the
drainage was southward
towards R Street from
the American River was
it not?

A. I believe it is

Q Well is not that
patent upon the face
of it?

A. Yes if that is
correct it is.

Q Well now is it not
also true that the
drainage from the banks
of the American River,
the natural bank, was
back from this further,
I call it a trough
now for conveniences
sake — into the trough
and along that trough
southward?

A. I do not know you
say backed up by
the American River did
you say it was backed
by the American River

into that trough?
 Mr Belcher No sir I did
 not say so at all, I
 say that from the
 American River all the
 drainage from the bank
 of the American River
 naturally, all the drainage
 was southward was it
 not?

A. Yes sir I think it
 was.

Q. And from the bank
 of the Sacramento River
 all the drainage was
 in Eastward towards
 this trough which fall-
 ows along down from
 the City down to the
 lakes and the Mok-
 elmne River?

A. I simply said that
 your assumption is true
 I do not know whether
 there ever was a trough
 here or not.

Q Well is it true that
 the bank of the Sacramento

River, the natural bank of the River was higher than it is back from the River?

A. I believe it was.

Q. Well don't you know it was?

A. I do not know of my own knowledge Sir.

Q. Have you ever seen the natural bank?

A. Not with except the last fifteen or sixteen years.

Q. Very good within the last 15 or 16 years how was it?

A. Well pretty much all filled up now.

Q. No matter what it is now was the bank of the River higher than it was back along the river?

A. I think the banks are certainly in some places higher.

Q. Don't you know that

they are in all places higher following down the bank of the Sacramento River, from Sacramento, or from the Old mouth of the American to Sutterville?

A. Yes I think they are however I am not familiar with it

Q. Then is it not true also that the bank of the American to River the south bank of the American was also higher than any portion of this trough, that is that the natural drainage passed from the banks of the Sacramento down into this low land - we will call it instead of trough?

A. Yes sir,

Q. And is it also true that the water from the banks of the Sacramento passed later

ward into this low land?
 A. Well that is where
 I do not think it did
 I think the natural
 drainage went out
 through the sub soil
 into the River when
 the River was below its
 present bed.

Q Your Idea is then
 that the Sacramento at
 Sacramento here was a
 very leaky River, that
 it leaked out and
 leaked in?

A. I think it does now

Q Well have you ever
 looked at the levee
 along on the north side,
 along on the American

A. I have yes sir

Q Well did that levee
 last winter leak did
 you see the water per-
 colating through it

A. I do not think that
 levee leaked nor I do
 not think our levees

Here leaked,

Q Then that levee did not leak there - this levee on the front of the City did not leak but when you get down a little below it did leak?

A I do not know.

Q Well did it to your knowledge?

A. No to my knowledge.

Q Is not the levee made of the same material as the natural bank?

A. No I think not, I think the seepage from the river comes below the natural bank, comes through the gravelly sub-soil -

Q Have you ever made any examination so as to know whether there is a gravelly sub-soil or not on the bank of the River?

A I do not know any-

thing about the bank
of the River but I know
about my own lot
in digging a cess pool
there what we found
Q You found a gravelly
sub soil?

A. Yes Sir.

Q Your lot is a deposit-
it has layers has it
not one overlaying the
other?

A. No sir I am talking
of a depth of 13 or 14 or 15
feet when we could dig
that deep, that is 12 or
14 years ago though

Q Doctor is it not a
matter of necessity that
if there was any such
leaking as that you
speak of, that when you
had dug that hole down
there, if, were then water
percolating through the
soil, and coming down
to that point the very
moment you touch it,

with your well or your
Cess pool, that tharmon-
ent the water would have
spouted right up through
it. So it did that is
exactly what it did do
and prevented me going
down any further

2. Could it not have contin-
ued so not only then but af-
terwards just the same?

a. Practically it did not

2. Just the same as digging
wells in the valley of San Jose

a. No sir, once you get to the
level - it all depends on the
height of the water; If the
river is low you can get down
and if the river is high you
can not. We dig those in the
summer when the river very low
and we ~~were~~ were able to go down
15 or 16 feet. Now we can
only go 6 or 7.

2. I want to ask you some
further questions, but first
in regard to another matter.
You have spoken of the Sewerage

here and of the canal below
 Do you know on what grade
 the Sewers of this City are
 constructed? A I do not
 know the exact gradient on
 which they are constructed
 of my own knowledge.

Q. You know that it is a
 very small grade, do you
 not? A I believe it is
 some 5 or 6 inches

Q. The what? A To the mile
 2. Five or six inches to the
 mile? A I am not sure
 about that, but I rather
 think that is about it

Q. Do you know the grade of
 the Canal below the City?

A Well, I believe that is
 only 2 or 3 inches to the mile
 I am not sure of that either

Q. Is that grade just the
 same now as it was when
 these sewers were first con-
 structed? A Well, I
 think they have endeavored
 to deepen it

Q. To increase the grade?

A. I think they have endeavored to do that

Q. Well, is it to increase or to Equalize the grade, that they have done this work that you speak of? A. Well, that I do not know

Q. You do not know whether it is to increase or Equalize it? A. I do not

Q. Is it not true, Doctor, that the grade of the Sewer and of the Canal is as good now as it could have been made when you first knew this City?

A. Well, I do not know that.

Q. You do not know it?

A. I do not know whether it is or not

Q. Well, is there any Evidence to you, from your Examination of the Sewer and the Canal, that there ever was a time in the history of the City, when it could have had a better grade? A. Well, I do not know that either

Q You do not know whether there is, or is not?

A I do not know whether it ever comes here had a better grade or not

Q Well, I ask you if there was any evidence which to your mind indicates that it ever could have had a better grade?

A I do not know of any evidence that would indicate that

Q Is that an open canal, Doctor?

A It is

Q An open canal from R Street southward?

A Yes sir I know the length of that Canal before it reaches the Mokelumne River

A I do not

Q The Mokelumne River is an affluent of the San Joaquin, is it not?

A Yes sir I believe so

Q Then the sewage and the drainage from this City passes from the City into

the Mokelumne River and through
the Mokelumne into the San
Joaquin, does it?

A I suppose it does if that
is the course of the Canal.

Q Well, don't you know that
that is the course of the
Canal?

A I am not
familiar with the Canal af-
ter it leaves Beeches Lake

Mr Cadwalader That is ten
miles below the City

Mr Belcher Beeches Lake,
then there is a canal from
that to carry it into Snod-
grass Slough, is it not?

A There was, I believe
Q And the Snodgrass Slough
has an outlet that empties
into the Mokelumne?

A Yes sir

Q And is not this the very
drainage or course of drain-
age which we now speak of?
First into Beeches Lake, then
from that into Snodgrass Slough
and through Snodgrass Slough
into the Mokelumne and then

into the San Joaquin the natural course of all the drainage from this City from the time it was first settled here?

A Well, I think there was a natural drainage from the City when the river was below, deep - when the City of Sacramento in fact was above the bed of the river over 20 feet, I think there was a natural drainage into the river then that is now stopped

Is that a seepage? I am asking you about the drainage? A Well, that is drainage

Is so far as the surface is concerned at any rate?

A The surface drainage is one thing and the seepage drainage is another

Q Very good, we will come at that again. I will ask you then if that was the natural drainage so far as the surface shows

A I believe it was
 2 Now, how much lower
 is the bed of this basin -
 or I call it basin, back we
 will say on R Street or on
 Y Street, how much lower
 is the bed of that basin
 or trough there, then the
 height say, the natural
 height of the bank at
 T. Street in the faerments?

A Well, I do not know
 what the natural height
 of the bank on T Street is,
 because it is artificial, the
 bank now, it has been
 filled up, I do not know
 what the natural bank
 is there.

2 Do you know what is
 the difference in the level
 between the natural bank
 of the river on Y Street
 and the center of this
 trough or basin?

A I do not,
 2 Do you know that it
 is considerable?

A I do not

I you do not know what it is? A No.

I on the other side of the depression Doctr, I mean now the 'depression' that runs from the City Southward toward Beecher Lake and on to the Mokelumne River - is there a slope on the other side of it on the Eastern side?

A I think there is I am not quite sure though about that

I Well, don't you know whether the land to the Eastward of it is higher or not?

A Beecher Lake?

I I mean the land to the Eastward of that - I have called it a trough and will still continue to use the word or depression?

A The drainage canal do you mean?

I The land to the Eastward of it? A I think the

land is higher there

2 Does it continue right on to the foot hills with a very gradual Elevation until it comes to the foot hill - I say gradual, increases Elevation

A Well, I think the land is higher along to the Eastward

2 Well, don't you know that it is a gradual ascent starting from any given point as for instance, from Beechey Lake or at the Riverside House and going directly Eastward.

A I think the land is higher there.

2. Constantly rising is it not? A I think so.

2 If that were the case would any of the natural drainage from the foot hills and from the plain enter - being between the foot hills and this depression naturally come in there?

A I suppose it would,

Water runs down hill generally.

Q I think the way that it generally come through the soil, sinking until it come to something that will bear water and then following along that? A That is the general course of water, J. L. S.

Q Well then, the natural drainage or at least a considerable portion of the natural drainage from all that district lying Eastward would naturally come in to this very trough, or other which should lie further to the south, or parallel with it? A Yes.

Q Is there any that you know of that lies in that direction, or would affect the drainage of the trough here or this depression until you come to the Cummins River?

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A Is there any thing that

affect it?

Q Is there any thing that would affect the drainage, carry off the drainage from that trough until you get back to the foot hill?

A You mean is there any thing that would stop it

Q Yes, or take it up, carry it off? A I do not exactly understand what you mean

Mr. Cadwalader Let me explain to you; for instance from 6th St. the drainage Canal takes a south Easterly course and runs two rods the brick building on the ridge back of Fittewell. There it strikes what is called the chain of lakes running back of the Riverside House until you get down in the neighborhood of Greepost when it apparently crosses a neck of land and then strikes another system of lakes

of which Beech Lake is one and then runs down towards the Mokelumne. That is about the configuration of the country.

Mr Belcher I understand that it continues it course in a south easterly direction and that it must receive as a matter of course a very considerable amount of drainage and the soil underneath being kept moist and wet from the drainage coming from the East ~~is~~ that so or not in your judgment?

A Yes certainly it must receive the

I (Intg) Now is not the grade of that canal as great now as it ever was have been in your judgment? A Well, I do not know. On the other side

I (Intg) So far as you have seen it — you have been down to Beeches Lake?

A Yes Sir

I Well, that far?

A It has been very much filled up on the river side of that

I. It was cleaned out was it not? A It has been cleaned out.

I Well, is the grade now any less than it was when it was first built? A Well, I am not familiar with that, I do not know

I It has it not sometimes been filled up by a sudden rain?

A No Sir, I never saw it fill by rain

I Or obstructed? A No Sir, I never saw it

I Have the sewers in the City been sometimes obstructed by a sudden shower which came very swift, a heavy fall of rain in a short time?

A That I do not know

I You do not know about that? A No Sir, I do not know. I never saw it

2. Now your idea of siphage is, that the ~~surface~~^{siphage} water percolates through the soil on from the river? A Yes sir

2 And raises the level of the water within the city?

A Yes sir, that is my idea of it

2 That it does so now and always did? A That I do not know

2 What would be the tendency of water suppose it were gravel, or any material that would carry water by siphing through it or percolation, what would be the effect upon that, if you should take muddy water and allow that to siph through it, water containing shavings or any kind of mud. By shavings I mean any kind of fine mud, what would be the effect?

A The effect would be that you would get perfectly clean water coming through it, it would be filtered

2. What would be the effect on the interstices forming the bed through which the water was passed? A. It would fill it up if it carried mud.

2. Well, is that true of the banks of the river here and of the banks of rivers elsewhere passing through alluvial soils or passing through any kind of soils, that in a comparatively short time - but it may be either short or long - that they do form a thick and imperviousness along their banks and beds which does absolutely prevent the passage of water out from the stream and into the adjoining lower country?

A. Of course any water filtered that way will produce a deposit in filtering that may be unperceivable to sight. But I do not think that would apply to the bottom of the river where the water is constantly washing it out.

2. Would it be true, wherever

You start with this, that you are going to have the water filter or percolate through, that whenever that water carries mud, fine sediment, that the mud will fill up all the holes so as to stop and absolutely prevent the percolation after some short time?

A That is what you would expect it to do
Q Would not it be true always? A It would

I suppose you were to build artificially of small gravel say as big as the end of my thumb, you were to build a Canal of just such material as that for a length of a mile and you were to pour muddy water through it would it not be true that after a comparatively short time that would begin to fill up all the interstices between the pieces of gravel, and that after a comparatively short time that would be-

Come a perfectly solid and
compact mass

Mr Hart. Speaking of standing
or running water?

Mr Delebe. I am speaking of
running water.

A I do not think with
running water that that comes
down. With standing water
it would be.

2. But the only way in
which water could get through
could be by passing through
in a winding course over
and through the interstices
would not it? Between the
pieces of gravel that would
be the way the water would
find its way out to the
city? A You are supposing
a wall on each side

I am supposing that they
built a channel like that
(referring) - I will come
back again to the question.

A Well, the theory may be
correct but the fact exists
that the water does arise

and fall with the river and
that is all I can say.

2. Well, I want you should
take a little more about the
theory. Now suppose we had
built a canal - that would
fairly represent the shape of
a canal although it might
be much smaller or much
larger might it not (illus-
trating with a sketch)?

A Lesson

2. Now, if through the wall
of that - I am supposing
now that we have built it
with those small pebbles, then
we turn in muddy water
where will it first begin to
fill? A Well, it would
fill in the interstices of course
2 And in the upper part?

A Lesson

2 And would it be constantly
sinking as it goes along until
it is filled and if we build
it a mile long, until it
would fill the whole, the
interstices?

A. Theoretically it ought, but I do not know whether it comes practically or not

Q Is that just the way, Doctor, that we find masses of rocks, cobbles and gravel cemented together? A Yes sir

Q Then if the bed of a stream like the Sacramento were in its first creation leaky in that way so that the water by percolation passes out through the bottom and through the sides into the surrounding country which was lower,

would it not be true that that would be constantly decreasing as that river or stream brought down muddy water from year to year?

A Well, I do not know whether it would or not.

Theoretically it ought to but practically it did not

Q Would not that theoretically be a necessary consequence?

A Theoretically it would be but practically I do not

think it is

I Practically you do not know — do you know practically? A. Practically I know that the water in our city rises and falls with the river

I that we admit to be the fact as you states it for present purposes, but what I am coming at is not the fact but that the water rises and falls here as the river does but I am getting at another thing — do you know at all, Doctor, about the natural drains of this City, that there were sloughs coming up through it; did you see it before these sloughs were filled

A I have seen it for the last 13 or 14 years, I do not know any thing before that.

2. Well probably then the sloughs were filled before that — were there when you first knew of any sloughs passing

from the neighborhoods of the American river southward into this low ground at R and Y Street coming lowest at 6th Street?

A I do not remember any just now, I do not remember any sloughs

Q How much water is pumped out from the Sacramento river for the use of this City annually? A Well, that I do not know

Q A very large amount of it? A A very large amount, yes sir

Q The streets cross one another here at right angles, North and South and East and West practically?

A Yes sir

Q What effort would the building of streets as they are built in this City have upon the blocks of land included within the streets - say take the block that is next south of us here

— There are streets bounding it upon its four sides. Now what effect would that have upon the water which comes farther in that block of land from all sources?

A I do not know what effect.

I would it have the effect of retaining the water therein — is the passage of the water as free as that, is the drainage of that block as good as before the street was built to the south of it?

A That I do not know

2. Well, let us suppose then, suppose we have a block of land square originally with a drainage tending in this direction Southward, this being north and that south (illustrating by sketch)

A Yes sir

2. Now we build a heavy street crossing on the south side say 80 feet wide as the street one or whatever

the streets may be, would the building of that street have any effect to keep back the drainage of this lot?

A. Of course it would

I then if we build one on the east and on the west that would have a still further tendency to keep the moisture or whatever there was that should gather in that block and keep it there.

A. Undoubtedly

Q. Would it have a tendency to raise the water level on that block so as to keep the water there in the summer particularly, at a much higher stage or much nearer the surface than it otherwise would be?

A. No, I do not think it would

Q. Why not? A. Because as the river goes down all the water drains out.

Q. Drains right out though a solid street does it just

As well as any where else?
 A Yes sir, drains right
 down through the gravelly
 subsoil

I Then if I understand you
 no matter to what depth
 these streets were sunk, or
 a solid and impervious
 mass though which water
 comes not yet, that the water
 comes come in from
 the river down under and
 then work its way up?

A It always does

Q. It works its way up?

A. Yes, sir

Q. That is theory of yours, is it not, doctor?

A. No sir that is a fact

Q. Is that a theory?

A. No sir, it is a fact

Q. Are you able to demonstrate as a fact that the water comes up from the river. Is that a fact that you can demonstrate?

A. I can demonstrate it as a fact as happening in my own house

Q. That it came from the river? A. I do not know where it came from, but I noticed that whenever the river came up, the water came up, and when the river came down the water came down, and from that I deduced the inference that it came from the river. When you get a cause to have a certain effect always

following it; you generally can locate the cause

2. Sometimes not. Doctors even have been mistaken as to the cause of disease from time to time? A. Yes sir. They have often been mistaken.

2. That is the subject of their particular study, and if a doctor should happen to be mistaken in a matter of hydraulics, it would not be any more wonderful than that he should be mistaken in matters of his own profession? When you speak of zymotic diseases, what do you mean? A. I mean infectious and contagious diseases.

2. Those that are infectious and contagious?

A. Yes sir.

2. Now you have spoken

of the sewers, and as well of the privy vaults, and of the cess pools. Is it true that there are a very large number of those privy vaults, which remain uncleaned or uncleaned from the time they were originally constructed here up to the present day?

A. Well, there may be some, but wherever they are it has escaped the Health Officer

2. When was it that the Health Officer began first to attempt to have the privy closets cleansed here in that way, that is through or by means of the odorless excavator?

A. It's been a few years. I do not know exactly when

2. About how long ago?

A. Well, I do not belong to the Board of Health, and I do not know exactly

2. Well, when first, to

your knowledge?

A. Well, I think it is four or five years, I could not exactly say when

Q. Well up to that time with the exception of the few vaults or closets that connect it with the sewers, all the rest, or a great portion rather of the rest had been standing uncleaned from the time of their first construction up to that time? A I do not know

Q. That you do not know. As far as you know, doctor, and have you had means of observing, and have you as a physician observed, and don't you know that very many of those old closets are so unwholesome in their stench that they would pretty nearly drive you away from them?

A. Well, there have been, I think a good many, I do not think the last few years that you could find many of them in the city

2. That are so fatal as they formerly were?

A. I do not think so

2. When you speak of that class of diseases, and particularly those of the typhoid character, do you mean that they are caused ~~from~~ many times or aggravated by gasses?

A. Are they caused by gasses, you say?

2. Yes. A. No sir, I do not think typhoid fever is caused by it, except you have got a typhoid germ there

2. A Germ where?

A. In the sewerage or in the gas

2. Well, if it be in the sewerage then it won't be taken up, will it

unless it passes off in gas? A. Unless it comes up - it may be in the air, or it may contaminate the water

2. The people of this city have not for many years used any water except that coming from the Sacramento River, have they? A. No sir, they have not

2. Well then, its coming from the water would not effect them?

A. Except there was a leak in the pipe, if there was any leaks in the pipes running through the city, so as to take in any of that sewerage matter

2. If there was a break in the pipe, would it let the water out or in?

A. It would let the water out

2. And not in? A. Yes sir

Q. Then you would not get it in the water, would you? A. They would not be very apt to get it in

Q. Well, then, when you spoke of that, you happened to think that if there were a hole in the pipe, if it were kept there long enough, might let it in before the water got out?

A. If there was a leak in the pipe, as soon as they stopped off the water, then the sewage might get into the pipe, and be carried on. Of course when the water was running through it; it would not

Q. You do not mean to mention that as one of the causes of disease?

A. No, It is one of the possibilities

Q. And it is a very remote possibility?

A. It is a possibility for all that-

Q. Well, when you speak of typhoids, are they not chiefly due to gasses, coming from foul matter?

A. No, I do not think so sir. Typhoid fever is the product of a specific germ that comes from excrement.

Q. And from that only?

A. From that only, as far as we now know

Q. Why do you ventilate privy closets?

A. For the purpose of carrying off the foul smell

Q. And carrying off the poisonous vapor also, the gas?

A. Well, human excrement is not absolutely poisonous, except you have got a poison germ in it

Q. How are you going to get the poison germ in it?

A. From another typhoid patient, a typhoid

case

Q. How are you going to start your first typhoid case? A. Well it has got to come from one antecedent to that

Q. You think then that the Lord first, or somebody created a typhoid patient or case in order to start the thing abroad in the world?

A. I do not know

Q. And started it loose so that somebody could ^{catch} ~~catch~~ it from him?

A. If you want me to admit spontaneous generation for you, I can do it, but I cannot go back that far

Q. You have got to get some kind of generation, either spontaneous, or a creative power behind it, have you not?

A. Yes sir

Q. One or the other?

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A. Yes sir

Q. Is it not true, doctor, that typhoid fever may be produced as well from the foulness that comes from a urinal, as from a closet? A. I do not think so

Q. Well, have you any good basis for your judgment in that? A. Well, I have got only the best authority in the medical world for it; I do not know but one man who admits spontaneous generation of typhoid fever, and that is Dr. Murchison, of London

Q. We are not speaking of spontaneous or any generation of it, but whether it might not come as well from the urinal as a closet? A. Those men all deny that urine ever produces typhoid fever

The Court I do not know how far this effects the question

Mr Belcher It effects the question only in this; that the Doctors statement was, that the typhoid fever, and the typhoid character of disease here, came from excrement, and was caused here or aggravated here by the fact that the sewage water rose nearly to the surface than formerly

Mr Cadwallader and that the obstruction of the fluid overflowed it and spread it over a larger area

Mr Belcher Is not the overflow of the lands through which this Canal passes any greater now than it was in 1849

A. I think it is

Q Do you know? is it
any greater now than
it was when you first
came to know it?

A. Yes - you mean the
amount of land that
is overflowed is greater
than when I knew it

Q Is it any deeper over
the particular ground over
or through which this
Canal passes?

A I think there is more
water there in the winter

Q Were you here in the
flood of 1861 and 62

A. I was not here, I
was in the state.

Q You were then at
Grass Valley? A. Yes sir

Q Then only from what
others may have told
you do you know as to
the amount or depth
rather of water in this
City? A. No I do not know
Q Or about it or any
lands below?

A Nothing about anything
at all

Q Have they have Typhoids
in Grass Valley?

A Yes sir they have had
typhoids.

Q And in a proportion
Equal to that of this
City?

A They had it just in
proportion as there drain-
age ran into the wells -
the drainage sewers ran
into the wells beneath
and in certain parts
of the town they would
have it whenever the
drainage ran into the
drinking water which the
parties below the town
being built on a hill, in
that part of the City they
had Typhoid fever almost
constantly

Q But here the drainage
does not run into the
water that is being used
for drinking or cooking

A. But that is the Cause
of it in Grass Valley

Q Well is that the Case
here or does the water
which is used for dom-
estic purposes for drinking
and Cooking is that affe-
cted at all?

A. It is not used here
at all but I was simply
Accounting for the Typhoid
fevers in Grass Valley

Q But the drainage from
Grass Valley and from the
other Towns up the Sac-
ramento and its Tributaries
Running into the Sacramento
and is brought down
for the Convenience of the
People here?

A. The drainage of Grass
Valley is into the Yuba
I believe or the Feather
River

Q Well the Yuba is an
affluent of the Sacramento
is it not

A. Well it is going a

long way up to bring it down here.

Q When this material is once taken up by the water, the water will hold it all the time?

A. Yes sir.

Q And Carry it?

A. Yes sir and Carry it.

Q Then when you get the germs of disease into the water at Grass Valley it will come here will it not?

A. Yes sir decidedly.

Q Then if they have the germs of disease in the water at Grass Valley and Nevada Marysville Colfax and Auburn and Red Bluff and all along where the River is inhabited, or rather its banks are inhabited — if the germs of disease once get into the water there, they will be brought down here will they not

A. They will be brought up here yes sir.

Q. Then if you pump the water out from the River you are pumping those diseases up here for the inconveniences of this people?

A. The diffusion would be so very great that your chances of getting one would be very small in that way.

Q. When you speak of a germ what do you mean?

A. I mean what has been described by professor ~~Dr. Ehrlich~~ Ehrlich of Zurich as a bacilla of spiroid shape sometimes of rod-like shape which he discovered and which he called the germ of that fever.

Q. Well now when you get one of those it will hold together will it or will it divide into a thousand parts?

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A Well its actions afterward
has not been thoroughly
examined yet

Q Practically? A. Yes

Q Well so far as you
understand it is it a
thing that holds together,
or is it something that
like a piece of sugar
when put into water,
dissolve into a thousand
particles or an indefinite
number?

A. No it has a rod like
body

Q It is a thing that
will hold to itself?

A. I think so

Q So that if that thing
gets into the water at
Grass Valley, that thing
will be the same thing
when it gets to Sacramento?

A. Precisely Yes Sir

Q Very good; then if one
of them gets into the
water at Grass Valley and
taken to Sacramento

it will have the same effect upon the individual who takes it in here as it would at Grass valley unless it has died meanwhile and has lost its vitality?

A. If he would happen to pick it up

Q Unless it has lost its power between the time it was put into the water at Grass valley and the time it should get here - it will produce the same effect even upon a little man like Mr Cadwallader if he should chance to take it?

A. Precisely it will

Q As if he had been in Grass valley?

A. It will yes sir.

Q You do not mean by that that the staying in the water will kill it?

A. No I do not

Q There is no determination

As to the length of time
it may stay there and
still retain its vitality?
A. It is very hard to kill
sir

Q. Then if there were a
great many towns on
the Sacramento above might
not that be not only a Re-
mote but a very near
and active Cause?

A. No sir it would not
be a near or an active
Cause, because the diffusion
would be so great by
the time it got down here-
the volume of water being
so great before it got down
here would diffuse the
germ and the chances
of there picking it up
would be one in some
trillions, or a higher
number, if you are getti-
ng at it that way?

Q. That is if there were
only one in a trillion drops
of water? A. Yes sir

Q But suppose you have
got a trillion of them in
a trillion drops of water?

A. Well you would have to
suppose a thing that we
know nothing about.

Q I think so too and
that was one of the things
I wanted to get out
that we did not know
very much about this
is there a woolen factory
in this City?

A. Yes sir I believe there is

Q Where is that?

A. It is on E Street, I
think it is on E.

Q And within the limits
of the City?

A. Yes sir.

Q On E Street and what
street running at right
angles to it?

A. I think it is 14 or
15th I am not quite sure
somewhere in that neighbor-
hood.

Q. Where does the factory

Obtain the water which it uses ?

A. Well that I do not know I suppose it obtains City water though I do not know it,

Q. They get it from some source or other ?

A. I suppose they do,

Q. Well now what use do they make of water ?

A. I do not know sir I am sure,

Q. Do you know whether in the use of it it becomes productive of disease, it becomes a stench in its neighborhood ?

A. I have never been in the Woolen Manufactory and I do not know any thing about it, I have never been there,

Q. Did not the northern part of the City suffer from Malaria when you first came to the City

A. Yes sir

Q Didnt it suffer at that time as much as it does now from Malaria?

A. I think it did

Q Then since 1868 that was as nearly uninhabitable as much as today from that Cause?

A. Well as long as I have known it it has never been a pleasant place to live

Q Is it now inhabited

A. Yes sir it is

Q Has it been during all the time since you first knew it?

A. It has been inhabited more or less, and when a family got very sick they would move out and another that did not know anything about it move in and then they would get sick and move out and a third party come in,

Q That is for the convenience of the doctors mainly? A. Yes sir

Q. Do you mean or did you mean doctor, that sand contains the elements of malaria?

A. If it contains vegetable matter it does

Q. Would it not then be true doctor, that very much the largest proportion of vegetable matter would be brought from the farming country around, that is where lands are being farmed? Rather than from the mines that are being worked? A. I suppose it would

Q. Would it not then be true that the seeds of disease - of malarial diseases particularly - which are spread over the lands by the waters, would be caused very much more largely, and almost altogether, by the operations of farmers

or agriculturalists, along the line of the river, or within the area drained by the river? A. Wherever water carries sediment, and it is spread upon the land, and the water residue leaves that sediment, you will always have malarial diseases, or seeds of disease.

Q Have you ever examined as to the character of mining debris, so called?

A. No sir, I know very little about mining debris.

Mr Cadwalader One part of the defense was that this debris was an enrichment of the soil; so that it was good soil to work.

Mr Belcher Doctor, have you ever made any analysis of any of the

material brought down by the river? A. No sir

Q. Then you don't know what its constituents are?

A. No sir I don't know anything about it. I only know of the effects of it.

Q. When have you made any examination to learn from any source direct, in any sense, the particular matters you speak of? as to vegetable matters coming down the river?

A. I have made no analysis of any of the soil.

Q. And yet you say, that so far as you know, the portions of the city where malarial diseases are now prevalent, were effected in the same way at the earliest times when you knew the city?

A There always has been more agree on the north side of the city, than on any other portion of the city.

Q. Do you say that most of or a majority of the privy closets in this city use the patent-ventilator? A. I didn't say anything about it, for I don't know. All the public privies do. They are attached to our public schools; I know that. And I see them in a great many private houses, but I don't know that they are in all of them, or a majority of them.

Q. You don't know as to the proportion at all? A. No sir.

Q. Is it not true that wherever these patent ventilators are used, that the tendency of them is to carry the germs of

disease, the foul gasses arising from these closets out into the air; disseminating them through the air? A. Yes sir

Q. Well, then, as a matter of health, would it not be as well or better if the privy closets were not connected by pipes with the buildings in which people live, and that there were none of these patent ventilators used at all?

A. Well, these patent ventilators are carried up above the roofs of the buildings

Q. Then they disseminate these gasses through the air? A. Yes sir they are disseminated through the air. They are carried off.

Q. Is not the poisonous and mephitic vapor that ends in fever, that breeds fever, heavier

than the light air above ventilators, and do they not then have a tendency to come down to the surface?

A. I think not. I don't think so

Q. Don't you know that is the fact?

A. I know that if these gasses were heavier they would not ascend into the air through the ventilating pipe. If these gasses were heavier they would not ascend. Whereas they ascend

Q. But they are carried up through a tube, are they not? A. Yes sir

Q. Have you not seen smoke rising from chimneys pots in the morning, and immediately after escaping from the chimney beginning to descend, and come to the surface?

A. If the superincumbent air is denser than the smoke and air combined, after the smoke goes out of the chimney, the smoke will pass off in a downward direction.

2. And would not that be the same with respect to the material passing up through one of these patent ventilators? In a like condition of the atmosphere would it not lose its tendency to rise, and fall or come down to the surface?

A. I presume it would. Like all other gasses, it would go according to the law of the diffusion of gasses. It would be subject to those laws.

2. Then is it not true that the fact that in modern buildings, which have their water closets con-

connected with the house; the pipes and traps reaching into the house, have a very deleterious influence on the health?

As productive of diseases?

A. If they are properly trapped, and the privy pipe is carried above the roof of the house, I don't think it does. If they are properly trapped

2. Is it not true that these traps are getting out of order? either on account of defective original plumbing, or because they become injured in some way?

A. I am sorry to say that that is the fact. They do.

2. Are they not much more directly the cause of this very class of diseases of which you complain here, than any other source of

disease? A. I don't think so sir. If you will allow me to explain why, I will tell you why I don't think so. Because this class of diseases, is found in a part of the city where they don't have these closets at all.

Q. And found there only?

A. That is only in the submerged portions. There is where we find this class of typhoid fever

Q. And there only?

A. There is where we find most of it

Q. Is it there only that you find it?

A. Most all of it. And I will tell you another thing in regard to that matter.

I don't know of any cases of this class of fever in these houses, where they have well trapped water closets, and efficient ventilators. If that is what-

you wish to know
Mr Cadwalader Mr Belcher
 this day is wearing away
Mr Belcher I hope you
 won't get worn out, I
 should be very sorry
 to part with you
Mr Cadwalader Have your
 subsided?

Mr Belcher Now, in the
 course of the examination
 by Mr Cadwalader, I
 think he evinced an
 anxiety to make you say
 that malaria had a di-
 rect tendency to make
 people insane? You
 didn't mean to say any-
 thing of that kind?

A. No sir

Mr Cadwalader He neither
 said anything of that kind,
 nor I. Nothing of the kind.
 That is one of your side
 bar remarks

Mr Belcher You asked
 him so many times as to
 what was the special

influence or effect on the body, or on this or that part of the body, and conditions of the mind, that you seemed to be making inquiry in that direction

Mr Cadwalader I asked the witness if this malaria did not have a depressing influence, rendering the body more liable to disease

Mr Belcher All diseases have a depressing influence, have they not? A Yes sir

Q. That is a characteristic effect of all diseases? A. Yes sir

Q. That is true of the toothache, and the headache, and neuralgi, and all that class of diseases?

A. Yes sir

Q. As well as of fevers?

A. Yes sir.

Q. As the population of

The city increased, did not the number of cess pools, and water closets increased? A. They have increased

2. The population of this city has increased considerably since you came here? A. Yes sir

2. And increased outside of the boundaries, or of the tracts that are in any way relieved by the sewers?

A. Yes sir

2. Was there not a considerable portion of the population of the city at the time that you came here, living outside of the tract that would in any way be relieved by these sewers?

A. I don't really know.

I am not really sure about that. I have forgotten. It is so many years ago

Q. Do you know how many sewers they had at that time?

A. I don't think they had any at all, until within the last 7 or 8 years.

That is, if speaking about main sewers, I can't tell about them, I can't tell their date. Of course those who were living outside the center of the city, didn't have any sewerage.

Q. Is there not a considerable portion of the population now that lives out beyond the reach and benefit of the 13th street-sewer?

A. Yes sir

Q. I desire to ask you again in regard to the woolen mill? Do you know whether or not that institution has any deleterious effect upon the health of this

city?

Mr Cadwalader He has already set that it did not

The Witness I don't know that it has. I don't know anything about it. I have never been there. I have never heard any complaints about it

Mr Belcher Now, so far as the water in the slough is concerned; you say that the water takes up more or less material from these privy closets and cess pools, and carries it into the soil? A. yes sir

Q. Do you mean then that when this material and we will now call it poisonous - comes out from these closets and cess pools, and is contained in the water, that the people in this city suffer any injury

or danger from it?

A. They suffer a certain amount of danger from it. Whenever organic matter is left upon the ground, whenever, if such matter be held in solution in the water, the water recedes from the land, it leaves this matter.

Q. When it recedes from the land, won't it take this matter along with it?

A. According to your own theory propounded a moment ago, it would not.

Q. Will it according to your theory? A. No Sir I say that it will not.

Q. Why? If it remain in solution, will it not be carried away?

A. It is in suspension.

Q. Let us look at that a minute, and see whether that is true or not? The

material from these closets is taken up by water in suspension or solution?

A. The disease germs are in suspension, supposed to be.

Q. That is very largely a matter of theory?

A. They are supposed to be.

Q. Suppose that theory is correct? That these germs are taken up and held in suspension, and not in solution? Now these matters you say may be raised nearer to the surface? When the water subsides, will the water take away these germs which it holds in suspension along with it, or will the water leave them on the surface?

A. On the surface.

Q. If the water leaves them on the surface, will their vitality cease?

A. The supposition is that it will not?

Q. What will become of it? A. That is a thing I can't answer. You mean the germs?

Q. What will become of them? If this seed stays on the ground, it won't do any harm?

A. The supposition is that when the sun or heat acts on them they become dry, and are lifted up in the dust, and are carried over the city.

And people are liable to breathe them and become infected. That is what is supposed to be the effect of them.

Q. Well, all that matter is for the present purely in theory?

A. Well, we know the effect; we know that disease follows these things. We know that to be the fact. We know that

when organic matter is deposited on the ground, and the sun and heat acts upon it and dries it, that it is raised in dust and disease follows

Q. Is it not true, so far as the question under consideration, as to the effect of cess pools and closets is concerned, that it is mainly through exhalations that come up from them, that the air is poisoned, and the disease is produced? A. I don't think it is mainly through that. I think you must have the germs or seeds of excrementitious matter, the diseased germ itself, carried into the system, either through the stomach or through the lungs. Foul smells of themselves do not

do not produce diseases, unless they have diseased germs in them.

Q. Have diseased germs in them? A. Yes sir

Q. Now do these foul vapors and odors that come up from these foul closets have diseased germs in them? A. Some of them have and some of them have not

Q. Doctor, how long is it since these cess pools began to be constructed at all? In this city?

A. That I cannot answer. That I do not know

Q. Well, is it true doctor, that when these sewers were first constructed, the grade was so small that they were not allowed to connect their privy vaults with them, otherwise than at a height sufficiently near the grade to allow the fluid

or liquid material to be carried off? A. Yes sir. I believe that is so.

Q. The same rule exists now with respect to these sewers, that existed on their original construction?

A. I think so.

Q. And the reason of it was that the grade was so small that the solid matter could not be carried off at all?

A. I don't know. I suppose that was the reason.

Q. When you speak of flushing the sewers here, do you mean that the sewers are flushed at all? Or have been, otherwise than when necessary to clear the pipes, the water pipes? The pipes that open into the sewers? Producing just that amount of flushing without any other cleansing whatever?

A. I do not mean that they have been regularly flushed with water; except such as came down through natural channels. The rain water would flush those water pipes

2. Then for the purpose of flushing the sewers by themselves, no pairs have been taken?

Mr Hart He didn't say that

The witness I have noticed men being sent down to clean them out through man holes. With shovels, etc. I have noticed that very often. In fact I see them cleaning them every week more or less

2. That would be very different from flushing them? A. Yes sir

2. Don't you know that they don't flush them at all? A. No sir. They have cleaned them out

in that way. They have a man hole that they go down through. They wash them out afterwards. I can't tell you exactly the process they go through. I know that they clean them out as thoroughly as possible.

2. But they did not do anything that you could call properly flushing a sewer?

A. There is not drainage enough to do that here.

2. If they were to put in the head of the sewer a sufficient quantity of water, it would flush them? A. Oh, it would. But probably at the lower end the water would spread all over the land. The cure would be worse than the disease.

2. Because the grade is greater in the city than when you get out?

A. The grade on a portion of the city is. The filled in portion. Where the sewers run.

2. Is it true, Doctor, that the canal itself, that is built below here, is of sufficient capacity to carry away all the water and material that will come from the sewers? Or is it insufficient?

A. It is sufficient, if there is no obstruction to the outlet.

2. Was there any obstruction to the outlet?

A. I believe so.

2. Do you know?

A. I don't know, but I believe so.

2. Have you seen it?

A. I have followed down that canal 8 or 10 miles, I think.

Q. Was there any obstruction in that 8 or 10 miles?

A. I don't know that there was

Q. Does the water flow with great rapidity, or at as great a grade and headway as it did when the canal was first constructed? A. I don't think

so, not in my opinion

Q. Was there anything in that distance to obstruct it? A. I don't know. It doesn't flow as rapidly as it did several years ago.

Q. Is there anything in that canal to obstruct it? A. I don't know.

Q. Have you seen anything? A. I have not seen anything

Q. Does the water flow along the entire length of it? A. That I don't know

Q. Was there anything

within a quarter of a mile below R street, or Y. street - was there anything there to prevent the flow of the water?

A. I don't know

Q. Have you ever been along there?

A. I have not lately. I only saw the canal in crossing down the riverside road, and again at Freeport. Those are the places where I have had an opportunity of seeing it

Q. When you saw it at the crossing of the riverside road, was the flowing there as great as the first time you ever saw it?

A. I don't think so

Q. What was there there to prevent its flowing as rapidly?

A. I don't know. But

the water would frequently be covered with scum, and with very offensive matter down there, That I know. It seemed to be almost at a standstill.

Q. When did you first know it at a standstill?

A. When I remember to have seen it several years ago, there was always a gentle current going along.

Q. Is not that the case now? A. It didn't seem to be the last time I saw it.

Q. How far was that below the city?

A. About a mile.

~~Re-direct Examination~~

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Mr Cadualader I want to ask you a question. Is the sewage water into this drainage ^{canal} water?

increasing from the Sacramento River

Mr Belcher I object to this as going over the same ground that was gone over in the first examination

Mr Cadwalader This is below Sacramento

The Court I don't know that is necessary to open that question, is it?

Mr Cadwalader This is seepage water from the Sacramento River, as it lies along the side of the canal. Has it been increased by the raising of the bed of the Sacramento?

The Court That would be opening another subject for cross-examination.

Mr Cadwalader No sir. This would be in reply to what was brought out by Mr Belcher.

Mr Belcher I asked him whether he noticed that—

The Court (Inty) Go on. That is probably the cheaper way.

Mr Cadwalader What has been the effect of the raising of the ^{bed of the} Sacramento upon the seepage of water from the Sacramento into this Canal below the city?

A. I think it has had, a tendency to obstruct the flow of the water. As it brings the water higher in the river. It keeps the water on a higher level by those lower lands

2. Mr Belcher asked you whether the land fell back from this city towards what he called a slough in the back of the city? I will ask you, whether you

have known any other slough here; except Burns Slough? A. I never have.

Q. Where is Burns' Slough with reference to the city? A. Burns' Slough is between J and K and L streets, and 20 and 21st streets.

Q. Where is Sutters Fort with reference to that slough? A. It stands on the bank of it.

Q. Don't the grounds slope from the banks of that slough towards the Sacramento, west?

A. Yes sir.

Q. Have you seen anything like a trough within the limits of Sacramento City north of J street? A. No, sir, I never have.

Q. Have you ever seen what is called a giddling of the bed of the Sacramento River, so as

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to prevent free ingress and ingress of the water in this city?

A. I have never seen it; no sir

Q. What do you say about the Sacramento River being the natural source of drainage of the city, provided its bed had not been filled up?

A. I think that that was the natural source of the drainage of the city before the bed was filled up

Q. What becomes of the overflow of the water, the overflow water, when the river gets below its natural banks

The Witness At present?

Q. Yes sir? When it gets below its banks.

A. The water remains in the ground here

Q. I mean, does it disappear from the sur-

4900

face? A. Yes sir

Mr Belcher Doctor; Have you ever made any comparisons by measuring the surface of the water on the land upon any one of these lots and the surface of the water in the river? A. No, sir

Q. You know nothing about the levels?

A. No sir

Q. And when you speak of this, - that the water falls, or keeps even with the water in the river - that is a matter purely of theory with you

Mr Hart The object; That-matter was not brought-out in our re-examination; Mr Belcher It was.

Mr Hart No sir, We simply examined in regard to what you had brought-out on that subject

Mr Belcher Was the

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surface drainage of Sacramento - any portion of it - naturally into the Sacramento River, above Sutterville?² or at any point? Into the Sacramento River? Was the drainage of Sacramento from the surface, the drainage of the dark land on which Sacramento is built, ever into the Sacramento River? A. I don't know about the surface drainage.

Q. Don't you know that it was not?

A. I don't know anything about it.

Q. Do you know that the banks of the river were higher than this depression at R street -² commencing at 6th street and extending southward? A. Of my own knowledge, I don't

know whether they were or not. I was not here in those earliest days

Q. Can you see the land from 6th street, going along towards the river? A. Yes sir

Q. Is it higher as you approach the river or lower? A. There is an elevation of the land down at Sutterville

Q. I am not talking about Sutterville? He will come right down to R and Y streets? At 6th street, and from that around, and coming towards the river, have you a natural surface drainage from there anywhere? A. I don't know

Q. Have you the natural surface there?

A. That I don't know

Q. You don't know whether that is the natural

surface or not? A. No sir.

Q. You are not capable of judging whether that is the natural surface or whether it has been filled up? A. I don't know whether it has been filled in or not.

Q. Then when you say that the surface drainage of the Sacramento was into the Sacramento or somewhere else, you are talking about things that you know nothing of?

A. No sir. I mean to say that when the bed of the Sacramento River is 17 or 20 feet deeper - as it was - then the natural drainage would be into the river, through this same porous soil that exists here.

Q. That is what you mean? That the drainage ought to be into

the river? You are speaking of what ought to be?

A. That would be Mr Cadualader as it would be, and should be. There is no doubt about that - Mr Belcher That is your testimony

Mr Cadualader That is common sense, and the result of 30 years observation

Mr Belcher I should think it was the result of ^{very} ~~uncommon~~ ^{years or} sense, during 30 years observation

2. Now in your re-direct examination as to Burns' Slough, did you mean to be understood as saying, that from Sutters Fort, and Burns' Slough, moving directly to the Sacramento River, there was a gradual and easy descent?

A. No, sir, I did not say that. I was asked

whether there was an elevation on the west side of Burns' Slough. I said that there was at ~~Sutter's~~ Sutter's Fort.

Q. Did you reply to the question as to whether there was a fall off to the Sacramento River?

A. I don't think I was asked whether there was a fall off to the Sacramento River. I don't recollect.

Q. If you did not mean that; what did you mean?

A. I don't think I said that.

Q. Is Sutter's Fort on the west side of Burns' Slough? A. It is on the east side. Burns' Slough runs diagonally across ^(L.) L. street.

Q. I am getting at your approximate level?

A. I don't know anything about the levels.

Q. From Burns' Slough is there a depression, and constant falling off of the ground until you come to 6th street, where this canal is built?

A. Burns' Slough runs down through L street and across M street, and down on O street, and 20th street, and then crosses over, and crosses R street, and comes out in the canal, I think.

Q. Suppose I represent this: The Sacramento River by these two lines that are parallel, or approximately so? Now the bank on the east side is higher than the country which lies a little back of it?

A. It has been made so, artificially.

Q. Was it originally?

A. I suppose so. I know

it should have been. I suppose it was. I suppose it must have been

Q. Now, is it not patent to you or to anybody who comes down there (showing), that from the point where that canal is made, there is a gradual elevation of the soil, until you come back to the bank of the river on that side? And from that point eastward, until you come to the plains and foothills?

A. I suppose there is

Q. Is not that patent, I say, to the eye of any man that comes down there? A. I don't know myself. I think that the ground slopes from Burns' Slough, down to the river. That is what I think myself. I think it is higher at Burns' Slough, than

it is nearer the river.
 I don't know the exact
 measurement of it, But
 it always appeared to
 me to be higher at Sutt-
 'ers' Fort than at the
 river

Q. Burns' Slough is
 to the eastward?

A. Yes sir

Q. And when you come
 farther westward, you
 come to lower ground
 than it is there. And then
 you rise gradually
 until you come to the
 bank of the river?

A. I don't think you
 do. I have always looked
 upon this as an the
 down grade. I have al-
 ways believed it to be
 down grade. Of course
 that may not be math-
 ically correct. I never
 believed that there was
 anything like a raise
 near the bank of the

river. I think myself that the natural drainage is into the river.

Q. That is your idea?

A. That is my idea of it.

Q. Is not this the true idea: That the natural drainage, the surface drainage, from a line commencing at the eastern line of the city, and following down to the mouth of the American, and to the Sacramento - and that would give us a north line, - is it not true that the natural drainage along that whole distance, tends southward? A. That is the direction which it tends now. But whether that was the natural tendency of it in early days, I do not know. There has been a great deal of filling in all over

the city, which tends to send the drainage that way.

2. When you get beyond the filling, is not the tendency of the water, ~~either~~ directly southward, and not westward? Most of it?

A. Yes sir. Maybe. Of course wherever the lowest part is, the water will run, - wherever that may be. I think the water goes southward there (pointing).

2. And does not come in here, so as to come against the new bank that is made here?

A. I don't know. I really haven't paid any attention to that.

2. That ought to be a matter that would attract your attention, doctor? Suppose there was a grade from the western

to the eastern portion of the river, that way (showing)? Or at a much less grade than that? And then an embankment built up along there, over half way? Then would it not be true that the water would come down and flow towards the river here, until it reached that embankment; and then flow under or across that embankment? A. Yes sir.

Q. Does it do that now?

A. I think the surface drainage is southward, so far as my observation goes.

Testimony
A. S. Greenlaw.

Direct Examination.

Mr. Hart Have you had occasion to examine the banks of the American River since the late rains? Within a few days?

A. I have examined the Banks.

Q. As to whether or not the water rose, after your last testimony was given? To any considerable height? And if so, how much?

A. Rose some four water to four feet.

Q. That is, four feet above low water?

A. Yes, Sir.

Q. Before the water had made this rise, did you make any examination of the sand bars?

A. I did.

Q. Did you make any

examination of any sand bar near the mouth of the American River, just before the slide?

A. I did.

Q. Where was that sand bar located?

A. It was located between 10th & 13th streets. Or near 10th st., & just above 13th street. Producing the lines of Sacramento City into the American River.

Q. That is between 10th and 13th streets?

A. A little above tenth to between 12th & 14th st.

Q. What measurement of that sand bar did you make?

A. I measured the width of the sand bar, and took the length of the sand bar from the range of the streets.

Q. Did you take the depth of it?

A. Yes, sir. I computed the depth of the sand bar

from the river.

Q. What width did you find it to be?

A. I stepped the sand bar - 140 steps.

Q. across?

A. From the bank to the farther point. To the river. The sand bar was somewhat in the form of a crescent.

Q. What size did you find the sand bar to be?

A. I estimated at that time that the sand bar contained 100 cubic yards of sand.

Q. That your estimate you made?

A. I did, at that time. That would take it from the bed of the river to the bank.

Q. One hundred cubic yards?

A. Yes, sir.

Q. Are you in earnest in saying that it was 100

cubic yards?

Mr. Belcher Object to this cross-examining this an witness.

Mr. Lottin. He has made his statement twice or three times.

Mr. Hart. Hold on further. I don't want to examine about a sand bar that contains only 100 cubic yards.

Witness. I will tell you how I came to the computation of the time. If this witness only examined a sand bar of 100 cubic yards, I will take him off the stand.

Witness. I examined not only that sand bar, but three or four other sand bars at the mouth of the river. I examined two upon the south side of the river. And I examined two at the north side of the river. — These sand bars lie between Sisler's bridge and the mouth of the river.

4916 q. so I understood you

to say, that a sand bar extending from 10th to 13th streets, and running across 148 feet contained only 100 cubic yards?

A. One hundred thousand cubic yards.

Q. Because if it contained only 100 cubic yards, how, going to ask how many fractions of an inch deep it was?

A. I meant 100,000 cubic yards.

Q. Now how much was the aggregate amount of cubic yards that you found in the several bars that you measured?

A. I computed (200,000) two hundred thousand cubic yards from the large sand bar near the mouth of the American river on the north side. That was considerably larger than either of these other sand bars. And higher.

Q. After the rise of the American river, did you adopt any means of ascertaining if it had been washed away? Any portion, & how much?

A. Yes, sir.

Q. Towards or into the Sacramento river?

A. Yes, sir.

Q. What did you do towards determining that?

A. I visited the river on Monday. Between the hours of 6 & seven o'clock. Very early. Perhaps at half past six. As soon as it was light. And the river had raised and was running a little quicker. Considerably quicker. And had raised several inches. I set a mark. That bar was cutting away. The river continued to rise. As it rose, I took measurements of the bar and of the depth of the water. At, more particularly, 3 1/2 o'clock

in the afternoon. And
 at one time intermediate.
 I didn't take the time of day
 at that time. Between 9 &
 10 o'clock. I also visited
 the sand bar on Tuesday morn-
 ing; and noticed the sand
 bar together with the sand
 bar below. At about
 7th street. Also noticed
 two two sand bars on the
 north side.

Q. What did you do after
 the river had come up, for
 the purpose of ascertaining
 how much had ~~been~~
 gone - had washed away?
 I want to get at your final
 figures, and and then I
 will turn you over to the
 other side, to search for
 these details? What did
 you do, to ascertain the
 amount that was
 washed away after the
 water came up?

A. I estimated the size
 of the bars, and the depth

of the bank washed away. I measured the bank above the water and the depth of the water.

Q. How did you measure above the water and to the bed of the water, or river?

A. With a pole. 15 feet long.

Q. After taking these soundings & measurements, did you calculate the gross amount that gone out of these bars, during that time?

A. I did.

Q. What was it?

A. 200,000 cubic yards washed away from the bars.

Q. Did you undertake to take any soundings in ~~the~~ a boat of the sand there at that time?

A. I did, within about half a mile of the mouth of the river. I did not get into the boat. I will state in regard to that matter. I had sound the bank of the river with

reference to the sand bar. They
 and also the sand bar. They
 had entirely disappeared. And
 also two bars on the north side.
 They had entirely disappeared.
 I made measurements of
 the bank where this bar
 was. There was six feet of
 water at ~~one~~ ^{one} place
 and seven feet at another.
 Then there was a man com-
 ing up in a boat. I met
 him at this point - about
 half a mile from the mouth
 of the river. He tried to get
 up to this point, but the current
 was so strong that he could not
 get up. I did not get into the
 boat. I proposed to take meas-
 urements of the river there. But
 he could not hold the boat in the
 river at the point where the
 sand bar was. So he went
 back. I had no boat of my
 own.

Q. How far from the mouth
 of the river was the nearest
 bar? Did you measure?

A. It was a little less than half a mile. That is, the lowest point of that bar. I am not speaking of the bar on the north side of the river. The bar on the north side was adjacent to the Sacramento.

Q. Which bar was it that went entirely out?

A. The two bars on this side. With the exception of eight steps. I stepped it out at its widest place. The other bars had entirely gone out of the river, except the bar at the mouth of the river on the north side. The upper portion of that bar was then coming off somewhat, and going into the river.

Q. A large portion of that bar on the upper side went into the river?

A. Yes, sir.

Afternoon Session

Recess until 2 o'clock P.M.

Mr. Hart. Did you make any examination to ascertain where the sand went to?



